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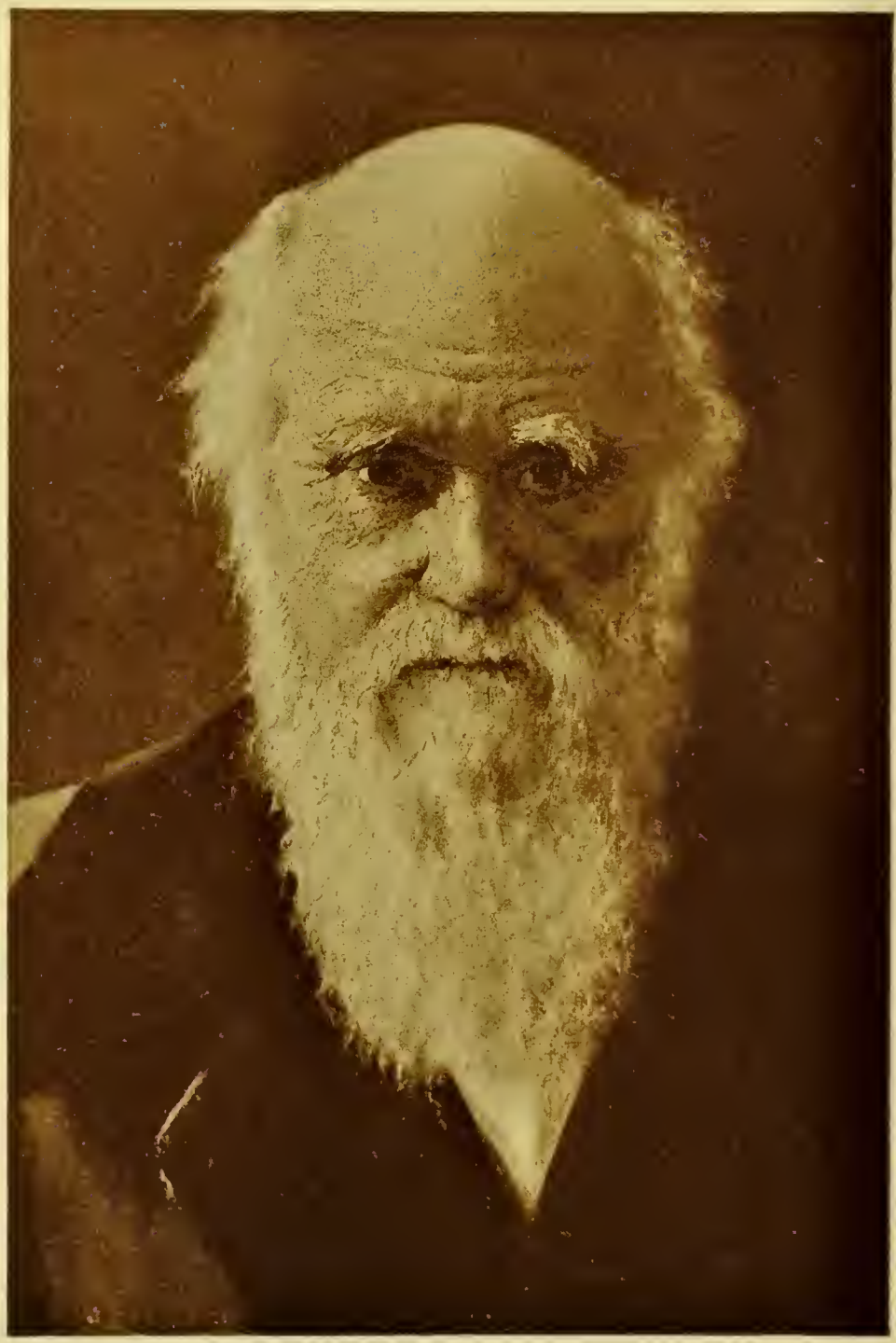
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Ch. Darwin

THE

DARWIN-WALLACE CELEBRATION

HELD ON

THURSDAY, 1ST JULY, 1908,

BY THE

LINNEAN SOCIETY OF LONDON.

LONDON:
PRINTED FOR THE LINNEAN SOCIETY,
BURLINGTON HOUSE, PICCADILLY, W.
1908.

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PLATES.

PLATE 1. C. R. DARWIN, F.R.S., F.L.S. (*Frontispiece.*)

2. The Darwin-Wallace Medal, modelled by Frank Bowcher. (*Facing page* 3.)

3. Address from the Royal Academy of Science, Stockholm. (*Facing page* 48.)

4. Dr. A. R. WALLACE, O.M., F.R.S., F.L.S.

5. Sir J. D. HOOKER, O.M., G.C.S.I., F.R.S., F.L.S.

6. Prof. E. H. HAECKEL, F.M.L.S.

7. Prof. A. WEISMANN, F.M.L.S.

8. Prof. E. STRASBURGER, F.M.L.S.

9. Dr. F. GALTON, F.R.S.

10. Sir E. RAY LANKESTER, K.C.B., F.R.S., F.L.S.

ERRATA.

Page vii col. 2, line 24, *read* "T. G. Hill."
,, viii ,, 1, ,, 32, *read* "I. Richards."
,, ,, ,, 2, ,, 7, *delete* "E. A. Smith."
,, 13, line 8, *for* "Celebes" *read* "Moluccan."
,, 19, ,, 21, *for* "genial works" *read* "works of genius."
,, 56, ,, 15, *for* "Byrne" *read* "Burne."
,, 63, col. 1, *after* line 31, *insert* "Mrs. Prain *."
,, 85, line 30, *for* "abstract" *read* "extract."
,, 137, ,, 26, *for* "Byrne" *read* "Burne."

INTRODUCTION.

The death of the eminent botanist Robert Brown on the 10th June, 1858, deprived the Linnean Society of a Vice-President and Councillor. Out of respect to its former President the subsequent meeting on the 17th June separated after formal business only had been transacted.

The vacancy thus caused had, by the Bye-Laws then in force, to be filled up within three calendar months, and the Council decided to call a Special General Meeting for this purpose, on the 1st July, 1858, rather than to bring the Fellows together again in September. The papers which had been set for being read on the 17th June, but abandoned, were again placed on the agenda.

As narrated by Sir Joseph Hooker on pp. 12–16 of the succeeding account of the Celebration, opportunity was taken to bring forward the papers by Mr. Darwin and Dr. Wallace, which are here reprinted from the Journal of the Society, thus introducing these novel views, in advance of the 'Origin of Species.'

The first indication of public interest in the fiftieth anniversary of the reading of the Darwin-Wallace papers,

was shown by a half-column article in the 'Tribune' newspaper of 20th February, 1907, entitled "A Scientific Jubilee: Projected celebration of Darwin's discovery." The next step was taken by the Council on 16th January, 1908, appointing a Committee of the Officers with Profs. Poulton and F. W. Oliver, to consider the best means of celebrating the event; this Committee, with some additional members, sat at frequent intervals during the period of preparation.

The draft programme having been approved, invitations were sent to the Fellows, Foreign Members and Associates, certain distinguished naturalists, every University in the United Kingdom, and Societies publishing on subjects of biology. It was also decided to widen the invitation so as to include the Royal Swedish Academy of Science, the relations between Sweden and the Linnean Society being especially close.

The Meeting-room of the Society being wholly insufficient for the expected audience, an endeavour was made to secure the use of the theatre of the Civil Service Commission in Burlington Gardens, but the date prevented its use; ultimately the President and Council of the Institution of Civil Engineers, Great George Street, were so obliging as to put their admirable theatre at the disposal of the Society.

In response to an appeal for pecuniary help to defray the unusual expenditure required for the Celebration, the following Fellows contributed the sum of £239 12*s.* 0*d.* in aid, the balance being borne by the corporate funds of the Society:—

Prof. R. J. Anderson.
Dr. Tempest Anderson.
E. A. N. Arber.
T. H. Archer-Hind.
R. Assheton.
The Lord Avebury.
A. W. G. Bagshawe
C. Bailey.
J. G. Baker.
Prof. I. B. Balfour.
R. M. Barrington.
Dr. H. C. Bastian.
Col. Beddome.
W. H. Beeby.
Dr. Margaret Benson.
Miss E. M. Berridge.
S. H. Bickham.
Prof. V. H. Blackman.
J. L. J. Bonhote.
L. A. Boodle.
Prof. G. C. Bourne.
Prof. F. O. Bower.
E. A. Bowles.
Dr. R. Braithwaite.
Prof. T. W. Bridge.
E. R. Burdon.
F. M. Burton.
H. Bury.
Dr. S. E. Chandler.
G. Christy.
W. Miller Christy.
Sir Frank Crisp.
Dr. F. Darwin.
Dr. A. E. Davies.
Prof. A. Dendy.
Prof. Denny.
J. R. Drummond.
Dr. B. Dyer.
R. Elmhirst.
Rev. Dr. G. H. A. Elrington, O.P.
Prof. J. B. Farmer.
D. Finlayson.
Rev. H. P. FitzGerald.
Dr. G. H. Fowler.
Dr. Helen Fraser.
W. G. Freeman.
Dr. F. E. Fritsch.
Rt. Hon. Sir E. Fry.
J. S. Gamble.
F. A. Gardiner.
J. Stanley Gardiner.
Rev. J. Gerard, S.J.
Miss L. S. Gibbs.
Dr. F. D. Godman.
Prof. P. Groom.
R. W. T. Günther.
H. H. Haines.
F. J. Hanbury.
Dr. G. Henderson.
Rev. G. Henslow.
Prof. W. A. Herdman.
A. W. Hill.
Prof. J. P. Hill.
F. G. Hill.
Prof. W. Hillhouse.
E. W. B. Holt.
Sir J. D. Hooker, O.M., G.C.S.I.
J. Hopkinson.
W. H. Hudleston.
C. C. Hurst.
Dr. B. Daydon Jackson.
H. Jones.
A. W. Kappel.
Prof. F. Keeble.
W. F. Kirby.
H. R. Knipe.
Sir E. Ray Lankester, K.C.B.
Dr. J. R. Leeson.
A. Lister.
Miss G. Lister.

J. J. Lister.
J. J. MacAndrew.
C. F. U. Meek.
Dr. J. W. S. Meiklejohn.
J. Cosmo Melvill.
H. T. Mennell.
L. C. Miall.
A. D. Michael.
R. M. Middleton.
Rev. C. H. Middleton-Wake.
H. W. Monckton.
H. W. Monington.
F. Morey.
C. A. Newman.
C. S. Nicholson.
A. W. Oke.
Prof. D. Oliver.
Prof. F. W. Oliver.
Dr. J. Oliver.
J. Parkin.
A. H. Pawson.
The Lord Peckover of Wisbech.
Miss D. F. M. Pertz.
R. I. Pocock.
Prof. M. C. Potter.
Prof. E. B. Poulton.
Lt.-Col. D. Prain, C.I.E.
C. Reid.
J. R. Reid, C.I.E.
Dr. A. B. Rendle.
J. Richards.
Miss E. Sargant.
E. Saunders.
Miss E. R. Saunders.
G. S. Saunders.
Dr. D. H. Scott.
Prof. A. C. Seward.
A. E. Shipley.
W. A. Shoolbred.
Miss S. M. Silver.
M. B. Slater.
Miss A. L. Smith.
E. A. Smith.
Rev. F. C. Smith.
Dr. W. Somerville.
G. B. Sowerby.
T. A. Sprague.
Dr. Otto Stapf.
A. E. B. Steains.
Mrs. Stebbing.
Rev. T. R. R. Stebbing.
A. W. Sutton.
Rev. A. Thornley.
J. S. Turner.
R. Vallentin.
Prof. S. H. Vines.
H. W. T. Wager.
A. O. Walker.
Prof. R. Wallace.
A. W. Waters.
A. Watson.
W. M. Webb.
Prof. F. E. Weiss.
W. P. Westell.
Miss E. Whitley.
Miss E. A. Willmott.
Dr. A. Smith Woodward.
B. B. Woodward.
Prof. E. P. Wright.
Prof. R. H. Yapp.
Lt.-Col. J. W. Yerbury.
A. P. Young.

LINNEAN SOCIETY OF LONDON.

DARWIN-WALLACE CELEBRATION.

1st JULY, 1908.

A SPECIAL MEETING of the Society was held in the Theatre of the Institution of Civil Engineers, Great George Street, at 2.30 P.M. on Wednesday, July 1st, 1908, to celebrate the Fiftieth Anniversary of the joint communication made by CHARLES DARWIN and ALFRED RUSSEL WALLACE to the Society, "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection."

The President of the Society, Dr. DUKINFIELD H. SCOTT, presided, and representatives of many scientific Societies and Universities were present. The Danish and Swedish Ministers were also present, and a representative of the German Embassy. The following members of the Darwin family also attended: Mr. William Darwin, Sir George and Lady Darwin, Dr. Francis Darwin, Major Leonard Darwin, and Mr. Horace Darwin; Mrs. Vaughan Williams, a niece of Charles Darwin, was also present.

The PRESIDENT, in welcoming the delegates and guests, said:—

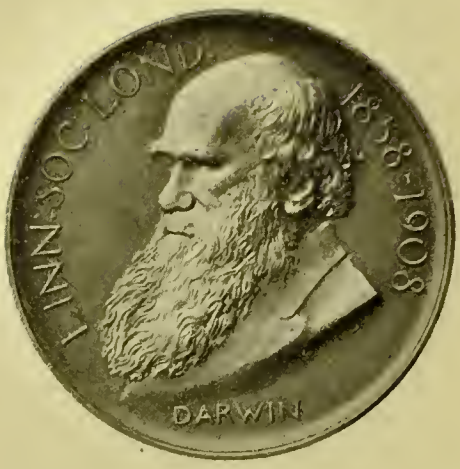
We are met together to-day to celebrate what is without doubt the greatest event in the history of our Society since its foundation. Nor is it easy to conceive the

possibility in the future of any second revolution of Biological thought so momentous as that which was started 50 years ago by the reading of the joint papers of Mr. Darwin and Dr. Wallace, "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection," communicated to our Society by Sir Charles Lyell and by Sir Joseph Hooker, whom we have the happiness of seeing with us to-day.

The papers, it will be remembered, consist of an extract from Mr. Darwin's then unpublished work on Species, for which he had been preparing during the previous 20 years, of an abstract of a letter from him to Asa Gray, the famous American Botanist, and of Dr. Wallace's paper, which he had sent to Mr. Darwin, "On the Tendency of Varieties to depart indefinitely from the Original Type."

In Mr. Darwin's contributions, the now classic terms "Natural Means of Selection" and "Natural Selection" are used for the first time. In Dr. Wallace's essay the same idea is expressed with equal clearness, as for example in the words "If any species should produce a variety having slightly increased powers of preserving existence, that variety must inevitably in time acquire a superiority in numbers." With both authors the key to evolution is at the same time the key to adaptation, the great characteristic by which living things are distinguished. Darwin and Wallace not only freed us from the dogma of Special Creation, a dogma which we now find it difficult to conceive of as once seriously held "Nec deus intersit, nisi dignus vindice nodus,"—they afforded a natural explanation of the marvellous indications of Design which had been the great strength of the old doctrine, and themselves, with their disciples, added tenfold to the evidences of adaptation. In like manner, if we are to see further advance now or in the future, any new development of the doctrine of evolution must be prepared to face, fairly and squarely, the facts of adaptation.

I am proud to welcome, in the name of the Linnean Society, the illustrious gathering which has assembled to commemorate an event, so unpretentious in its circumstances, so profound in its significance. The presence among us of





DARWIN-WALLACE MEDAL.
1st July, 1908.

Dr. Wallace, one of the two creators of the theory, and of Sir Joseph Hooker, who brought it into the world, is in itself enough to render our meeting memorable, and to ensure its success. Among the other Medallists to whom we render due honour to-day, while we regret the absence of Prof. Haeckel and Prof. Weismann, those valiant champions of evolution, we rejoice to have with us Prof. Strasburger, representing in our own day the great school of Hofmeister, who, by his unequalled morphologieal researches in the field of Botany, made ready the way for the 'Origin of Species.'

The two great schools of evolution in this country, the School of Genetics (to use the modern term) and that of Morphology, are represented by their distinguished leaders, Dr. Galton and Sir Ray Lankester.

The President then read the following telegram received that morning from Prof. Engler, F.M.L.S. :—

"Steglitz, 1sten Juli, 1908.

"Linnean Society, Burlington [House], London, W.

"Zur heutigen Feier der Erinnerung an die hervorragenden Verdienste von Darwin und Wallace sendet seine herzliehen Glueckwuensche—A. Engler, Berlin."

We have a long programme before us, and I think it would be best that we should now proceed at once to what is the main business of our meeting, the presentation of the medals to those distinguished gentlemen whom we are asking to receive them.

The presentation of the Darwin-Wallace Medals was then proeeeded with, the first to come forward, at the request of the President, being Dr. Alfred Russel Wallace, F.R.S., F.L.S., who was received with great enthusiasm. In presenting the gold medal the President said :—

Dr. Alfred Russel Wallace, We rejoice that we are so happy as to have with us to-day the survivor of the two great naturalists whose crowning work we are here to commemorate.

Your brilliant work, in Natural History and Geography,

and as one of the founders of the Theory of Evolution by Natural Selection, is universally honoured and has often received public recognition, as in the awards of the Darwin and Royal Medals of the Royal Society, and of our own Medal in 1892.

To-day, in asking you to accept the first Darwin-Wallace Medal, we are offering you of your own, for it is you, equally with your great colleague, who created the occasion which we celebrate.

There is nothing in the history of Science more delightful or more noble than the story of the relations between yourself and Mr. Darwin, as told in the correspondence now so fully published,—the story of a generous rivalry in which each discoverer strives to exalt the claims of the other. We know that Mr. Darwin wrote :

April 6, 1859.—"You cannot tell how much I admire your spirit in the manner in which you have taken all that was done about publishing our papers. I had actually written a letter to you stating that I would not publish anything before you had published." Then came the letters of Hooker and Lyell, leading to the publication of the joint papers which they communicated.

You, on your side, always gave the credit to him, and underestimated your own position as the co-discoverer. I need only refer to your calling your great exposition of the joint Theory, "Darwinism," as the typical example of your generous emphasising of the claims of your illustrious fellow-worker.

It was a remarkable and momentous coincidence that both you and he should have independently arrived at the idea of Natural Selection after reading Malthus's book, and a most happy inspiration that you should have selected Mr. Darwin as the Naturalist to whom to communicate your discovery. That theory, in spite of changes in the scientific fashion of the moment, you have always unflinchingly maintained, and still uphold as unshaken by all attacks.

Like Mr. Darwin, you, if I may say so, are above all a Naturalist, a student and lover of living animals and plants—

as shown in later years by your enthusiasm and success in gardening. It is to such men, those who have learnt the ways of Nature, as Nature really is in the open, to whom your doctrine of Natural Selection specially appeals, and therein lies its great and lasting strength.

Finally, you must allow me to allude to the generous interest which you have always shown, and continue to show, in the careers of younger men who are endeavouring to follow in your footsteps.

I ask you, Dr. Wallace, to accept this medal, struck in your honour and in that of the great work inaugurated 50 years ago by Mr. Darwin and yourself.

Dr. A. R. Wallace replied :—

Mr. President,—I beg to thank the Council of the Linnean Society for the very great honour they have done me, in coupling my name with that of Charles Darwin on the celebration of this anniversary, and for the still greater and more exceptional honour, of perpetuating my features with those of my illustrious forerunner, upon the Medal you have now awarded me.

With your permission I propose to make a few remarks both as to the actual relations between Darwin and myself prior to July 1858, and also to some peculiarities of our respective life-histories which brought about those relations, and which will, I hope, be both novel and of some general interest.

Since the death of Darwin in 1882, I have found myself in the somewhat unusual position of receiving credit and praise from popular writers under a complete misapprehension of what my share in Darwin's work really amounted to. It has been stated (not unfrequently) in the daily and weekly press, that Darwin and myself discovered "natural selection" simultaneously, while a more daring few have declared that I was *the first* to discover it, and that I gave way to Darwin!

In order to avoid further errors of this kind (which this Celebration may possibly encourage), I think it will be well to give the actual facts as simply and clearly as possible.

The *one fact* that connects me with Darwin, and which, I

am happy to say, has never been doubted, is that the idea of what is now termed "natural selection" or "survival of the fittest," together with its far-reaching consequences, occurred to us *independently*, and was first jointly announced before this Society fifty years ago.

But, what is often forgotten by the press and the public, is, that the idea occurred to Darwin in October 1838, nearly twenty years earlier than to myself (in February 1858); and that during the whole of that twenty years he had been laboriously collecting evidence from the vast mass of literature of Biology, of Horticulture, and of Agriculture; as well as himself carrying out ingenious experiments and original observations, the extent of which is indicated by the range of subjects discussed in his 'Origin of Species,' and especially in that wonderful store-house of knowledge—his 'Animals and Plants under Domestication,' almost the whole materials for which works had been collected, and to a large extent systematised, during that twenty years.

So far back as 1844, at a time when I had hardly thought of any serious study of nature, Darwin had written an outline of his views, which he communicated to his friends Sir Charles Lyell and Dr. (now Sir Joseph) Hooker. The former strongly urged him to publish an abstract of his theory as soon as possible, lest some other person might precede him—but he always refused till he had got together the whole of the materials for his intended great work. Then, at last, Lyell's prediction was fulfilled, and, without any apparent warning, my letter, with the enclosed Essay, came upon him, like a thunderbolt from a cloudless sky! This forced him to what he considered a premature publicity, and his two friends undertook to have our two papers read before this Society.

How different from this long study and preparation—this philosophic caution—this determination not to make known his fruitful conception till he could back it up by overwhelming proofs—was my own conduct. The idea came to me, as it had come to Darwin, in a sudden flash of insight: it was thought out in a few hours—was written down with such a sketch of its various applications and developments as

occurred to me at the moment,—then copied on thin letter-paper and sent off to Darwin—all within one week. *I* was then (as often since) the "young man in a hurry": *he*, the painstaking and patient student, seeking ever the full demonstration of the truth that he had discovered, rather than to achieve immediate personal fame.

Such being the actual facts of the case, I should have had no cause for complaint if the respective shares of Darwin and myself in regard to the elucidation of nature's method of organic development had been thenceforth estimated as being, roughly, proportional to the time we had each bestowed upon it when it was thus first given to the world—that is to say, as 20 years is to one week. For, he had already made it his own. If the persuasion of his friends had prevailed with him, and he had published his theory, after 10 years'—15 years'—or even 18 years' elaboration of it—*I* should have had no part in it whatever, and *he* would have been at once recognised, and should be ever recognised, as the sole and undisputed discoverer and patient investigator of the great law of "Natural Selection" in all its far-reaching consequences.

It was really a singular piece of good luck that gave to me any share whatever in the discovery. During the first half of the 19th Century (and even earlier) many great biological thinkers and workers had been pondering over the problem and had even suggested ingenious but inadequate solutions. Some of these men were among the greatest intellects of our time, yet, till Darwin, all had failed; and it was only Darwin's extreme desire to perfect his work that allowed me to come in, as a very bad second, in the truly Olympian race in which all philosophical biologists, from Buffon and Erasmus Darwin to Richard Owen and Robert Chambers, were more or less actively engaged.

And this brings me to the very interesting question: Why did so many of the greatest intellects fail, while Darwin and myself hit upon the solution of this problem—a solution which this Celebration proves to have been (and still to be) a satisfying one to a large number of those best able to form a judgment on its merits? As I have found what seems to me

a good and precise answer to this question, and one which is of some psychological interest, I will, with your permission, briefly state what it is.

On a careful consideration, we find a curious series of correspondences, both in mind and in environment, which led Darwin and myself, alone among our contemporaries, to reach identically the same theory.

First (and most important, as I believe), in early life both Darwin and myself became ardent beetle-hunters. Now there is certainly no group of organisms that so impresses the collector by the almost infinite number of its specific forms, the endless modifications of structure, shape, colour, and surface-markings that distinguish them from each other, and their innumerable adaptations to diverse environments. These interesting features are exhibited almost as strikingly in temperate as in tropical regions, our own comparatively limited island-fauna possessing more than 3000 species of this one order of insects.

Again, both Darwin and myself had, what he terms "the mere passion of collecting,"—not that of studying the minutiæ of structure, either internal or external. I should describe it rather as an intense interest in the mere *variety* of living things—the variety that catches the eye of the observer even among those which are very much alike, but which are soon found to differ in several distinct characters.

Now it is this superficial and almost child-like interest in the outward forms of living things, which, though often despised as unscientific, happened to be *the only one* which would lead us towards a solution of the problem of species. For nature herself distinguishes her species by just such characters—often exclusively so, always in some degree—very small changes in outline, or in the proportions of appendages, as give a quite distinct and recognisable *facies* to each, often aided by slight peculiarities in motions or habits; while in a large number of cases differences of surface-texture, of colour, or in the details of the same general scheme of colour-pattern or of shading, give an unmistakable individuality to closely allied species.

It is the constant search for and detection of these often unexpected differences between very similar creatures, that gives such an intellectual charm and fascination to the mere collection of these insects ; and when, as in the case of Darwin and myself, the collectors were of a speculative turn of mind, they were constantly led to think upon the "why" and the "how" of all this wonderful variety in nature—this overwhelming, and, at first sight, purposeless wealth of specific forms among the very humblest forms of life.

Then, a little later (and with both of us almost accidentally) we became travellers, collectors, and observers, in some of the richest and most interesting portions of the earth ; and we thus had forced upon our attention all the strange phenomena of local and geographical distribution, with the numerous problems to which they give rise. Thenceforward our interest in the great mystery of *how* species came into existence was intensified, and—again to use Darwin's expression—"haunted" us.

Finally, both Darwin and myself, at the critical period when our minds were freshly stored with a considerable body of personal observation and reflection bearing upon the problem to be solved, had our attention directed to the system of *positive checks* as expounded by Malthus in his 'Principles of Population.' The effect of this was analogous to that of friction upon the specially-prepared match, producing that flash of insight which led us immediately to the simple but universal law of the "survival of the fittest," as the long-sought *effective* cause of the continuous modification and adaptation of living things.

It is an unimportant detail that Darwin read this book two years *after* his return from his voyage, while I had read it *before* I went abroad, and it was a sudden recollection of its teachings that caused the solution to flash upon me. I attach much importance, however, to the large amount of solitude we both enjoyed during our travels, which, at the most impressionable period of our lives, gave us ample time for reflection on the phenomena we were daily observing.

This view, of the combination of certain mental faculties

and external conditions that led Darwin and myself to an identical conception, also serves to explain why none of our precursors or contemporaries hit upon what is really so very simple a solution of the great problem. Such evolutionists as Robert Chambers, Herbert Spencer, and Huxley, though of great intellect, wide knowledge, and immense power of work, had none of them the special turn of mind that makes the collector and the species-man, while they all—as well as the equally great thinker on similar lines, Sir Charles Lyell—became in early life immersed in different lines of research which engaged their chief attention.

Neither did the actual precursors of Darwin in the statement of the principle—Wells, Matthews or Prichard—possess any adequate knowledge of the class of facts above referred to, or sufficient antecedent interest in the problem itself, which were both needed in order to perceive the application of the principle to the mode of development of the varied forms of life.

And now, to recur to my own position, I may be allowed to make a final remark. I have long since come to see that no one deserves either praise or blame for the *ideas* that come to him, but only for the *actions* resulting therefrom. Ideas and beliefs are certainly not voluntary acts. They come to us—we hardly know *how* or *whence*, and once they have got possession of us we cannot reject or change them at will. It is for the common good that the promulgation of ideas should be free—uninfluenced by either praise or blame, reward or punishment.

But the *actions* which result from our ideas may properly be so treated, because it is only by patient thought and work, that new ideas, if good and true, become adopted and utilised; while, if untrue or if not adequately presented to the world, they are rejected or forgotten.

I therefore accept the crowning honour you have conferred on me to-day, not for the happy chance through which I became an independent originator of the doctrine of "survival of the fittest," but, as a too liberal recognition by you of the moderate amount of time and work I have given to

explain and elucidate the theory, to point out some novel applications of it, and (I hope I may add) for my attempts to extend those applications, even in directions which somewhat diverged from those accepted by my honoured friend and teacher—Charles Darwin.

The President: Before going on to present the next medal I should like to call the attention of the meeting to these specimens of *Berberis Darwinii* which Sir Joseph Hooker has kindly presented to us, a plant discovered by Charles Darwin himself in South America, and named, in his honour, by Sir Joseph's father, Sir William Hooker.

Sir Joseph Hooker, in coming forward to receive the medal presented to him, was also received with great enthusiasm.

In making the presentation the President said:—

Sir Joseph Hooker, It is with profound pleasure and affection that we welcome to-day one of whom Mr. Darwin, 50 years ago, wrote as "our best British Botanist, and perhaps the best in the world," words which have only gained in force in the half-century that has elapsed since they were written.

But on this occasion our minds dwell, not so much on your unrivalled work as a leader of botanical science, as on your close and unique relation to the Darwinian theory. It was you to whom Mr. Darwin, in January 1844, first communicated his views on the question of the 'Origin of Species,' when he used those famous words, "I am almost convinced that species are not (it is like confessing a murder) immutable!"

When fearing, in 1854, that his health might not permit him to complete his work, it was you whom he chose (to quote his own words) as "by far the best man to edit my species volume." You were, indeed, his most intimate friend during the growth of the 'Origin of Species,' as well as in later years; your acute criticism and vast knowledge were at every point of essential service in the development and verification of the theory.

It is to your wise and just action in conjunction with his other close friend, Sir Charles Lyell, that we owe the publication of the joint papers which form the glory of our Society, and the production of which we are commemorating to-day.

Your early appreciation and unswerving support of a doctrine too often misunderstood, did more than any other circumstance to ensure a fair hearing among true men of Science for the theory of the Origin of Species by means of Natural Selection, leading ultimately to its general acceptance.

The incalculable benefit that your constant friendship, advice, and alliance were to Mr. Darwin himself, is summed up in his own words, used in 1864, "You have represented for many years the whole great public to me."

Of all men living it is to you more than to any other that the great generalisation of Darwin and Wallace owes its triumph, and as a symbol of the Society's appreciation of the invaluable service which you rendered, in this way as in many others, to Biology, I ask you to accept the Darwin-Wallace Medal.

Sir Joseph Hooker said:—I have been honoured by receiving from the Council of our Society a request that I would take up a little of your time and attention with a brief address. No theme or subject was vouchsafed to me by the Council, but, having gratefully accepted the honour, I was bound to find one for myself. It soon dawned upon me that the object sought by my selection might have been that, considering the intimate terms upon which Mr. Darwin extended to me his friendship, I could from my memory contribute to the knowledge of some important event in his career. It having been intimated to me that this was in a measure true, I have selected as such an event one germane to this Celebration and also engraven on my memory, namely, the considerations which determined Mr. Darwin to assent to the course which Sir Charles Lyell and I had suggested to him, that of our presenting to the Society, in one communication, his own and Mr. Wallace's theories on the effect of variation

and the struggle for existence on the evolution of species (see Jour. Linn. Soc. iii. (1859) pp. 45–61).

You have all read Francis Darwin's fascinating work as Editor of his father's 'Life and Letters,' where you will find (Vol. ii. p. 116) a letter addressed, on the 18th June, 1858, to Sir Charles Lyell by Mr. Darwin, who states that he had on that day received a communication from Mr. Wallace written from the Celebes Islands requesting that it might be sent to him (Sir Charles).

In a covering letter Mr. Darwin pointed out that the enclosure contained a sketch of a theory of Natural Selection as depending on the struggle for existence so identical with one he himself entertained and fully described in MS. in 1842, that he never saw a more striking coincidence: had Mr. Wallace seen his sketch he could not have made a better short abstract, even his terms standing "as heads of my chapters." He goes on to say that he would at once write to Mr. Wallace offering to send his MS. to any journal; and concludes: "So my originality is smashed, though my book (the forthcoming 'Origin of Species'), if it will have any value will not be deteriorated, as all know the labour consists in the application of the theory."

After writing to Sir Charles Lyell, Mr. Darwin informed me of Mr. Wallace's letter and its enclosure, in a similar strain, only more explicitly announcing his resolve to abandon all claim to priority for his own sketch. I could not but protest against such a course, no doubt reminding him that I had read it, and that Sir Charles knew its contents, some years before the arrival of Mr. Wallace's letter; and that our withholding our knowledge of its priority would be unjustifiable. I further suggested the simultaneous publication of the two, and offered—should he agree to such a compromise—to write to Mr. Wallace fully informing him of the motives of the course adopted.

In answer, Mr. Darwin thanked me warmly for my offer to explain all to Mr. Wallace, and in a later letter he informed me that he was disposed to look favourably on my suggested compromise, but that before making up his mind he desired

a second opinion as to whether he could honourably claim priority, and that he proposed applying to Sir Charles Lyell for this. I need not say that this was a relief to me, knowing as I did what Sir Charles's answer must be.

At Vol. ii. pp. 117, 118 of the 'Life and Letters,' Mr. Darwin's application to Sir Charles Lyell is given, dated June 26th, with a postscript dated June 27th. In it he requests that the answer shall be sent to me to be forwarded to himself. I have no recollection of receiving the answer, which is not to be found either in Darwin's or my own correspondence ; it was no doubt satisfactory.

Further action was now left in the hands of Sir Charles and myself, we all agreeing that, whatever action was taken, the result should be offered for publication to the Linnean Society.

On the 29th June Mr. Darwin wrote to me in acute distress, being himself very ill, and scarlet fever raging in his family, to which an infant son had succumbed on the previous day, and a daughter was ill with diphtheria. He acknowledged the receipt of letters from me, adding, "I cannot think now of the subject, but soon will: you shall hear as soon as I can think" ; and on the night of the same day he writes again, telling me that he is quite prostrated and can do nothing but send certain papers for which I had asked as essential for completing the prefatory statement to the communication to the Linnean Society of his and Wallace's Essays. This was only 48 hours before the reading of the Paper laid before the Society by Sir Charles and myself on July the 1st. It may be interesting to recall that the last ordinary meeting of the session of this Society is held in the middle of June. The occasion of the meeting on the 1st July was exceptional, and was due to the death of the eminent botanist, Robert Brown. As a mark of respect to that great Past President, the ordinary meeting of June the 17th was adjourned, and a special meeting called in order to elect a successor to the vacancy on the Council, caused by his decease, George Bentham being nominated in his place. The usual election of council and officers had taken place at the Anniversary

Meeting only a month before; and, oddly enough, for the first time among the new members of that body was Charles Darwin. Other Papers were also read at the special meeting on the 1st of July, but it will not have escaped your notice that the whole correspondence relating to the two Papers on the evolution of species was subsequent to the 17th of June; indeed, the joint letter from Sir Charles Lyell and myself communicating them to the Society was only written on June the 30th.

Thus the death of Robert Brown was the direct cause of the Theory of the Origin of Species being given to the world at least four months earlier than would otherwise have been the case.

The communications were read, as was the custom in those days, by the Secretary to the Society. Mr. Darwin himself, owing to his own illness and distress, could not be present. Sir Charles Lyell and myself said a few words to emphasise the importance of the subject; but, as recorded in the 'Life and Letters' (Vol. ii. p. 126), although intense interest was excited, no discussion took place: "the subject was too novel and too ominous for the old school to enter the lists before armouring."

It cannot fail to be noticed that all these inter-communications between Mr. Darwin, Sir Charles Lyell, and myself were conducted by correspondence, no two of us having met in the interval between June the 18th and July the 1st, when I met Lyell at the evening meeting of the Linnean Society; and no fourth individual had any cognisance of our proceedings.

It must also be noted that for the detailed history given above there is no documentary evidence beyond what Francis Darwin has produced in the 'Life and Letters.' There are no letters from Lyell relating to it, not even answers to Mr. Darwin's of the 18th, 25th, and 26th June; and Sir Leonard Lyell has at my request very kindly but vainly searched his Uncle's correspondence for any relating to this subject beyond the two above mentioned. There are none of my letters to either Lyell or Darwin, nor other evidence of their having existed beyond the latter's acknowledgment of the receipt of

some of them ; and, most surprising of all, Mr. Wallace's letter and its enclosure have disappeared. Such is my recollection of the day the 50th Anniversary of which we are now celebrating, and of the fortnight that immediately preceded it.

It remains for me to ask your forgiveness for intruding upon your time and attention with the half-century old, real or fancied memories of a nonagenarian as contributions to the history of the most notable event in the Annals of Biology that had followed the appearance in 1735 of the 'Systema Naturæ' of Linnæus.

The President : We much regret that our distinguished Foreign Member and Linnean Medallist, Professor Haeckel, is prevented by his academic duties from being present to-day, but Herr von Bethmann-Hollweg, of the German Embassy, has kindly attended to receive the medal on his behalf.

Prof. Haeckel, a personal friend of Mr. Darwin's, who paid more than one visit to him at Down, has been the great apostle of the Darwin-Wallace theory in Germany. His advocacy of the doctrine of Evolution in his Monograph of the Radiolaria (1862), first brought it before the attention of German men of Science; his enthusiastic and gallant advocacy ever since has chiefly contributed to its success in that country.

Mr. Darwin, in 1873, wrote to Prof. Haeckel, "You will do a wonderful amount of good in spreading the doctrine of Evolution, supporting it as you do, by so many original observations."

A brilliant writer and investigator, author of a number of classical Zoological Monographs, Prof. Haeckel has become especially distinguished for his writings on Phylogeny, above all the great 'Generelle Morphologie,' and for his popular works, such as the 'Schöpfungsgeschichte,' which have exercised a great and wide influence on the present generation.

The stimulating vigour of his style roused a keen and general interest in evolution in the early days of Darwinism.

His phylogenetic pedigrees have played a useful and important part as aids to the imagination and as familiarising the mind with the idea of Descent, at a time when the evolutionary conception was still obscure. They are intended rather as artistic endeavours to picture what happened in the past than as dogmatic statements of historical sequences.

Haeckel, so distinguished in the laboratory, has, like Darwin, Wallace and Hooker, a strongly developed Naturalist side, shown by his scientific travels, in the Canaries, Ceylon, and elsewhere. He, too, is a thorough Darwinian, who has remained loyal to the principle of Natural Selection.

A man of world-wide reputation, the leader on the Continent of the 'Old Guard' of evolutionary Biologists, Prof. Haeckel is one whom our Society delights to honour, and I ask you to transmit to him the Darwin-Wallace Medal, as a testimony of our admiration and respect.

I will go on at once to present the medal awarded to Professor August Weismann.

Like his countryman Prof. Haeckel, Prof. Weismann is unfortunately unable to leave his University at this season of the year, and those, especially, who have had the pleasure of meeting him on former visits, will regret his absence to-day.

Prof. Weismann has played a brilliant part in the development of Darwinian theory, and is indeed the protagonist of that theory in its purest form, retaining all that was the peculiar property of Darwin and Wallace and eliminating the traces of Lamarckism which still survived.

It is not for me, on this occasion, to enter into his special researches in Zoology: of the many original investigations for which he is distinguished, that on the origin of the germ-cells in Hydrozoa is peculiarly noteworthy, as having led up to his great doctrine of the Continuity of the Germ-plasm as the foundation of a Theory of Heredity. This doctrine, involving the conclusion that all inherited variations must be congenital, and that consequently there can be no hereditary transmission of characters acquired during the life of the individual, aroused the deepest interest, and that not only in scientific circles. It has produced a lasting effect on Biology,

and however much modified, Weismann's doctrine forms the basis of modern views of heredity.

The lucidity and beauty of his style has helped to render Prof. Weismann the effective champion of all that is most characteristic in the teaching of Darwin and Wallace, while his profound knowledge of cytology enabled him to base his theory of heredity on a firmer foundation of fact than had been possible in the case of previous speculations.

Prof. Weismann's works, many of them so admirably translated into English, have met with universal appreciation in this country. I well remember my own keen enjoyment in reading his essays, such as 'The Duration of Life,' 'On Life and Death,' on Continuity, and on the Theory of Natural Selection. The work of this brilliant investigator and writer has been of immense service to evolutionary Biology; and, apart from all matters of controversy, the stimulating influence of his writings has had a wonderful effect in advancing the subject.

There is no one to whom the award of this medal could be more appropriate.

Herr Dietrich von Bethmann-Hollweg: I thank you, Sir, on behalf of Professor Haeckel and Professor Weismann for the great honour your Society has conferred upon them.

The President: I should like to mention that we have a communication from Professor Haeckel which I am sure you would wish to hear read, and I will therefore ask Professor Dendy to read it.

Address *communicated to the Afternoon Meeting of the Linnean Society on the* 1*st July*, 1908, *by* Prof. Ernst Haeckel (Jena).

The formal celebration of the first of July by the Linnean Society, the fiftieth anniversary of the day on which the joint essay by Charles Darwin and Alfred Wallace: "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of

Selection," was read before the Society, was certainly justified by its incomparable importance, which the Darwinian theory has acquired for all branches of human science in the last fifty years, and by the deep reform of human thought effected by the scientific discovery of the true human origin.

The German University of Jena belongs to those places of scientific work, in which the universal signification of the Darwinian theories was immediately received and practically employed in a long series of splendid works of celebrated naturalists. In a few weeks (at the end of this month, on the 30th or 31st July) the University of Jena will celebrate the 350th anniversary of its foundation. On this memorable occasion, I intend to dedicate to our Academy the new Phyletic Museum, founded by me on the first of January 1907. The building which is just completed of this first Museum of Phyletic Science will not only be an historical and biological collection of all the different materials belonging to the science of evolution, as well ontogeny as phylogeny, but it will be a true temple of Darwinism, a perpetual monument of all those highest philosophical conceptions for which we are indebted to the genial works of Charles Darwin and his grandfather Erasmus, of Alfred Wallace and Joseph Hooker, of Charles Lyell and Thomas Huxley—of their predecessors in France, Jean Lamarck and Geoffroy St. Hilaire, and in Germany, Wolfgang Goethe and Reinhold Treviranus. The portraits and biographies of these eminent champions of evolutionary sciences, and of their numerous leading followers will be collected in the Phyletic Archiv and Library, which form a remarkable part of my Phyletic Museum. Another part of the same will be dedicated to the actual, comparative and experimental study of the separate branches of the Darwinian theory. A special anthropological part of the Phyletic Museum will contain all those important documents of human origin, which have been treated by me in the 'Anthropogenie,' and to which I was conducted by Darwin's classical work: 'The Descent of Man and Selection in Relation to Sex,' and by Huxley's excellent lectures on 'Man's Place in Nature.' Numerous objects, books, and illustrations will explain this most important branch of Darwinism.

Among all the splendid progress of science in the celebrated 19th century, the contribution of the development theory by Charles Darwin, in my sincere opinion, is by far the most important, and all future history of human culture will celebrate the 1st July 1858 as the monumental day on which the foundation of his fame was fixed.

ERNST HAECKEL.

The following letter expresses Prof. Weismann's views on the subject :—

Freiburg i. Br.
19 April, 1908.

Linnean Society of London.

SIR,

Ich habe die Einladung erhalten, welche Sie die Güte hatten, mir zu senden im Auftrag der Linnean Society of London. Es ist ein schöner Gedenktag, den Sie am 1 Juli feiern wollen und ich würde mich freuen, an demselben Theil zu nehmen. Leider aber ist mir unmöglich, um diese Zeit nach London zu kommen.

Ich bitte Sie deshalb, der Linnean Society meinen verbindlichsten Dank für ihre Einladung zu sagen; ich werde in Gedanken den wärmsten Antheil an der Feier eines Tages nehmen, den für die Wissenschaft von so grosser und bleibender Bedeutung gewesen ist.

Ich habe die Ehre zu sein,
Ihr sehr ergebner,

AUGUST WEISMANN,
Prof. Zoologie.

The President, in presenting the medal to Prof. EDUARD STRASBURGER, said :—

This is not the first time that our Society has done itself the honour to recognise, in a special manner, your high position in Biological Science. Three years ago the Linnean Medal was awarded to you, for your work as a great botanical histologist and morphologist ; to-day we desire to mark our appreciation of your achievements from

another point of view, as a contributor to the study of evolution. It is a great gratification to us all that on this occasion you are able to be present, and to me, in particular, that the pleasant duty has fallen to me of making this presentation, in the name of the Society, to one whom I not only admire as a great leader of our Science, but may venture to regard as a personal friend.

In a number of directions your work has a clear relation to the doctrine which Darwin and Wallace first placed on a scientific basis.

Your morphological researches, from the early work on *Azolla* onwards, have always been guided by the evolutionary idea. I think it is in your great book 'Die Coniferen und die Gnetaceen,' that you specially speak of the inspiration which you received from the ideas of Charles Darwin. Developmental investigations, such as we owe to you above all other living botanists, have a direct bearing, as you have always recognised, on questions of Descent.

In a still higher degree the modern science of Cytology, of which, on the botanical side, you are the founder, has the closest relations with the study of heredity, of which it promises to reveal the material basis, and thus contributes to just that part of evolutionary theory which is the most progressive at the present day.

But there is another aspect of your work which more especially appeals to the followers of Darwin and Wallace. To a Darwinian, as it seems to me, all structure is essentially and originally an adaptation; broadly speaking, there is no structure without function, no morphology without physiology. One of the greatest evils in Biology, in spite of Darwinian influence, is the separation of these two aspects of the same facts. Now it is a great characteristic of your work on the anatomy of plants that you have always studied the morphology and physiology of the tissues side by side. Your monumental work 'Die Leitungbahnen' affords perhaps the greatest example we have of an extensive investigation in which equal regard has been paid to structure and function, and equally striking results attained

in both directions. It is on such lines that research will be pursued when the principles of Darwin and Wallace are laid to heart by the investigator.

I feel it an equal honour and pleasure to hand you the Darwin-Wallace Medal.

Prof. Eduard Strasburger, F.M.R.S., F.M.L.S., replied :—

Mr. President, Ladies and Gentlemen,

In my youth, in the best period of my development, the Darwinian ideas had begun their triumphant course throughout the cultivated world. I had the good fortune to study at Jena and with a master ten years older than myself, who professed with enthusiasm the new ideas on evolution. This master was Ernst Haeckel, towards whom, with youthful expansiveness, I soon felt myself attracted. For nothing is more contagious than enthusiasm ; and this was transmitted to me, not only in the lecture room, but also during the distant wanderings through the poetical Saal-Valley, in which I often had the advantage of accompanying him. Both being touched in a high degree by the beauties of nature, we became impressed amidst those charming surroundings. When the day was waning, we sat down on the side of a slope, high above the valley, awaiting the sunset and the purple glow of the twilight on the opposite mountains. The beautifully-formed, barren heights stood out clearly against the blue sky ; in wide bends the limpid river wound through the deep green meadows and groves, and the silhouette of the venerable old town of Jena rose high in the distance, still clad in its mediæval garment. This led Ernst Haeckel to comparisons with the valley of the Arno, the fascinating Florentine landscape, that had impressed him so deeply, and these descriptions awakened boundless yearning towards Italy, then still unknown to me. We used to start homeward in an elevated frame of mind, and Ernst Haeckel would enlarge on the universal importance of those great notions on development, which emanated from Charles Darwin and laid my mind under their spell.

Since then many decades have gone by, and yet those impressions of my youth live on in my memory, as vivid as on the first day; for they have decided the course and object of my life's work. I turn back to them with longing, with that self-same longing which Goethe so powerfully expressed in his Introduction to Faust, where he recalls the time of joyous growth when every bud a marvel promised:

> ". . . . that time of pleasures
> While yet in joyous growth I sang—
> When, like a fount, the crowding measures
> Uninterrupted gushed and sprang!
> The bright mist veiled the world before me,
> In opening buds a marvel woke,
> As I the thousand blossoms broke,
> Which every valley richly bore me!"
>
> (*Bayard Taylor's translation.*)

The seed I received at Jena sprang up early. I took the path of phylogenetic speculation and have pursued it faithfully.

The amount of experience which Charles Darwin had gathered during his voyage round the world, the widely spread knowledge which his critical mind was able to sort and combine towards large views, the deep comprehension with which he penetrated the history of former ages, that was the soil on which grew his gigantic work, 'On the Origin of Species by means of Natural Selection.' With the indefatigable labour of acute sagacity, he was able to draw the substance of his proofs even from the remotest sources: out of works which had received until then no scientific utilisation, out of periodicals consulted only by practical animal and plant breeders.

As a matter of course, the sum of knowledge existing at the time drew final limits even to the genius of a Darwin. New facts have been added since then, by which his theories are completed, amplified, also corrected. But however far

science may progress, time will never erase the traces of Charles Darwin's investigations.

When Darwin believed he had erred, he never hesitated to admit it. Here again he showed the mettle of really great men, whose intellectual wealth easily supports a loss, whereas indigent minds cling anxiously to their presumed property.

Only of few intellectual lights can it be said, as of Charles Darwin, that, even where he was mistaken, he paved the path that leads to truth.

The development of biological science received through Darwin's work an impulse such as rarely emanates from a single investigator. He showed Biology the way it has since then trodden.

I also trace back to Darwinian impulse the line and aim of my own work. I therefore pronounce the name of Charles Darwin with profound respect and gratitude.

When I was young the investigations and the thought of Alfred Russel Wallace also brought me a great stimulus. Through his 'Malay Archipelago,' a new world of scientific knowledge was unfolded before me. On this occasion, I feel it equally my duty to proclaim it with gratitude.

And now let me also express my thanks to you, Mr. President, and to the Fellows of the venerable Linnean Society, for the great distinction you have bestowed upon me. The medal you have conferred on me, bears the portraits of Charles Darwin and of Alfred Russel Wallace: it is an honour which fills me with legitimate pride that my scientific labour should thereby be brought into contact with the efforts of those great Pioneers of Biology.

The President then addressed Dr. Francis Galton. He said:—

Evolution, as understood by Darwin and Wallace, depends upon three factors, Heredity, Variation, and Natural Selection. In the study of the first of these factors, Heredity, the work of the present day is characterised by the application of exact methods, whether on biometrical or

Mendelian lines. It was you, Dr. Galton, who first showed the way by which exact measurement could be applied to the problems of evolution and heredity, and indicated that their laws must be susceptible of proof. You have pointed out a new method, and the possibility of a more logical treatment of evolutionary questions. By establishing such principles as that of "Recession to Mediocrity" you have added new laws to evolution, and under the name of "Cessation of Selection" you have suggested an explanation of degeneration following disuse, anticipating that afterwards independently proposed and elaborated by Weismann, and called by him Panmixia.

The ingenuity of your methods, your energy and enthusiasm in applying them, and your constant interest in the work of others, and readiness to help them, have made you a great power in the advancement of evolutionary studies; a power which has only been strengthened by your characteristic open-mindedness and willingness to accept new views.

You have shown, throughout the wide range of your work, that exactness of method is consistent with the charm of style: and we may recall the words of your cousin Mr. Darwin, in speaking of your famous book on Hereditary Genius, "I do not think I ever, in all my life, read anything more interesting or original."

The new departure which you inaugurated in the study of Evolution, has been previously recognised by the award of the Darwin Medal of the Royal Society. We desire to add our own recognition of the originality and importance of your work by asking you to receive the Medal which commemorates the united discoveries of Darwin and Wallace.

Dr. Francis Galton, F.R.S.: I thank you for your kind remarks, Sir. You have to listen to-day to many speakers, and I have little new to say, little indeed that would not be a repetition, but I may say that this occasion has called forth vividly my recollection of the feelings of gratitude that I had towards the originators of the then

new doctrine which burst the enthraldom of the intellect which the advocates of the argument from design had woven around us. It gave a sense of freedom to all the people who were thinking of these matters, and that sense of freedom was very real and very vivid at the time. If a future Auguste Comte arises who makes a calendar in which the days are devoted to the memory of those who have been the beneficent intellects of mankind, I feel sure that this day, the 1st of July, will not be the least brilliant.

Sir E. Ray Lankester, K.C.B., F.R.S., F.L.S., was the next and last recipient of the medal: the President said:—

Your work as a great original investigator in Comparative Anatomy, Embryology, and Palæontology, and as the author of many standard works in Zoology and philosophical Biology has been inspired throughout by the Evolution idea, of which you are one of the most brilliant exponents.

Among your own contributions to the theory, I should like to refer to your treatment of the subject of Degeneration, or Reduction, a phase of Evolution of which the importance becomes more manifest with every investigation. Your statement that "The hypothesis of Degeneration will be found to render most valuable service in pointing out the true relationships of animals" holds good just as fully for plants. I am convinced that there is still too much reluctance, at least on the botanical side, to make use of this hypothesis, and that reduction has probably played a far larger part in evolution than is yet realised.

Your conception of homoplastic modification, leading to similar organisation in distinct lines of descent, has proved no less fertile, and the importance which you have attached to the study of Bionomics, to use your own term, anticipated the great development which the investigation of the conditions of life has since shown, under Prof. Warming's name of Ecology.

Your more popular works have spread the knowledge of Evolution beyond the limits of scientific circles: my own

predilections lead me to refer especially to your charming book on Extinct Animals, which brings home to every intelligent mind, as no other book does, the historic evidence of Evolution.

You have ever shown yourself a true Biologist, whose interests have always extended to plants as well as to animals, and whom on many occasions botanists have welcomed as a helpful friend and ally.

In the controversies inseparable from the advancement of a great principle, you have always been the vigorous and consistent advocate of Darwinism in the strict sense, and like Weismann in Germany, you, in England, have striven to uphold and to develope, on the lines of Darwin and Wallace, the doctrine of the Origin of Species by means of Variation and Natural Selection.

On all these grounds, and on many others, did time allow me to state them, I have great pleasure in handing you the Darwin-Wallace Medal.

Sir Ray Lankester, K.C.B., F.R.S., F.L.S., replied :—

Mr. President, Ladies and Gentlemen,

It is a great and stirring occasion on which we are here assembled to-day. There are those among us who remember well the first of July fifty years ago, when Sir Charles Lyell and Dr. Joseph Hooker communicated to a meeting of the Linnean Society the independently thought out views of Charles Darwin and Alfred Russel Wallace as to the origin of species. Never was there a more beautiful example of modesty, of unselfish admiration for another's work, of loyal determination that the other should receive the full merit of his independent labours and thought, than was shown by Charles Darwin on that occasion.

Subsequently, throughout all their arduous work and varied publications upon the great doctrine which they on that day unfolded to humanity—as an absolutely new and untried engine of thought—the same complete absence of rivalry characterised these high-minded Englishmen, even

when in some outcomes of their doctrine they were not in perfect agreement.

It is a delightful thing for us all to see here still among us, still working and writing, one of those two whose achievement of fifty years ago we celebrate—Dr. Alfred Russel Wallace. And it is no less a cause of happiness that we shold have with us the great botanist and traveller—Sir Joseph Dalton Hooker; older than Wallace by some years, yet still full of strength and wisdom. We all know how greatly Sir Joseph Hooker's investigations and writings on the Flora of the Southern Hemisphere contributed to the development of Darwin's views and arguments, and how he was almost daily in correspondence with Darwin during the latter half of the past century.

My own personal recollection does not extend to the great day in July, 1858, but when the 'Origin of Species' was published in the following year, and the controversy and criticism which it excited burst upon us, the battle became a part of my daily life.

I mention this because I think I am able to say that great as was the interest excited by the new doctrine in the scientific world, and wild and angry as was the opposition to it in some quarters, few, if any, who took part in the scenes attending the birth and earlier reception of Darwin's 'Origin of Species,' had a pre-vision of the enormous and all-important influence which that doctrine was destined to exercise upon every line of human thought.

When the 'Origin of Species' appeared there were many men alive who had witnessed the opposition to the geological doctrine of "uniformity" put forward by Charles Lyell, who was soon to accept the Darwin-Wallace Theory, and was regarded by Darwin himself as a sort of elder brother in science—the man of all others whose adherence he desired.

Lyell had been denounced and persecuted socially for his geological teaching, but the storm had passed, the uniformitarian geology had been accepted without causing a revolution. Most scientific men thought that the same general acquiescence would follow the denunciations hurled

against Darwinism; but there was one who, more clearly than others, saw the immense consequences of the establishment, by means of the Darwin-Wallace Theory of Natural Selection, of the general doctrine of evolution of organic beings, and of the derivation of man himself from an animal ancestry. This was the great and beloved teacher, the unequalled orator, the brilliant essayist, the unconquerable champion and literary swordsman—Thomas Henry Huxley.

Huxley had been a merciless opponent of the doctrine of evolution as expounded by Lamarck and by Robert Chambers. They had (he pointed out) failed to discover any mechanical conditions from the operation of which organic evolution must ensue. But the Darwin-Wallace principle of survival of the fittest in the struggle for existence satisfied Huxley's requirement. He became the convinced advocate of the new doctrine, though I think it is true that he clung to a little heresy of his own as to the occurrence of evolution by saltatory variation, and also to another as to the efficacy of the physiological test known as "fertile cross-breeding," as a means of discriminating true from simulative species. It was Huxley who, in admirable popular addresses, brought the new doctrine before the minds of intelligent laymen, and especially emphasised its application to the origin and ancestry of mankind. When the Progressive members of the Austrian Parliament shouted in a stormy debate that they were "Für Darwin!" the significance of the new conception of the nature of living things, including man, became evident, and it was recognised that "Darwinism" must in the future guide statesmen and politicians as well as men of science. It is in its application to the problems of human society that there still remains an enormous field of work and discovery for the Darwin-Wallace doctrine.

The science of heredity, of fecundity and sterility, of variation and adaptation, has to be far more completely studied and developed in its application to man and to human aggregates than it yet has been; at the same time a true psychology has to be arrived at and made, together with a knowledge of heredity, the basis of education, of the

government, and of the prosperity of the modern state. How far we are from any satisfactory progress in this direction, the words and the actions of political leaders of all parties at this moment fully demonstrate.

The effect of the Darwin-Wallace doctrine in stimulating the investigation of the structure of recent and fossil plants and animals, and of the embryology or growth from the egg of all living things, in order to arrive at a knowledge of their ancestry and genealogical relationships, was quite remarkable. That class of study overshadowed the more difficult experimental work as to variation and heredity which was carried on by Mr. Darwin himself and some of his followers.

The attempt to construct a genealogy of the animal kingdom was boldly entered on by Ernst Haeckel, of Jena, whom you have this day honoured by association with Wallace, Hooker, and Galton in the award of the medal commemorative of this great occasion. The philosophic character of Haeckel's writings, and the complete adoption by him of the doctrine of descent as the guiding principle of zoological investigation, gave a special value and influence to his work, which is fitly recognised to-day. He was the first to apply the newly accepted doctrine to all branches of morphology and to systematic zoology and botany—and did so with the convincing power of a wonderful range of knowledge and unbounded enthusiasm. The new doctrine led me into the study of the growth from the egg of various forms of animal life in the search for evidence of genetic affinities and divergences, and to the re-examination of the structure of various animals by aid of the new light of the theory of descent, and the improved methods of microscopical research of those days. The two foremost of my friends and companions in this work—Frank M. Balfour and Henry N. Moseley—were taken from us prematurely, but not before they had made splendid contributions to the understanding and alignment of animal forms on the new basis prepared by Darwin and Wallace. I gratefully acknowledge, in the association of my name to-day with that of the great veterans of our science,

to whom the Linnean Society has awarded the Darwin-Wallace Medal, the recognition of the labours of my dear friends who are gone, and of our pupils whom it is my privilege and high honour to represent. I also feel that in admitting me to this great honour—the greatest which life has brought to me—you must have regarded me as in some measure a surviving link with that champion of Darwinism, the incomparable Huxley, to whose teaching and friendship I owe so much.

At the present moment there is less enthusiasm than there was in the pursuit of morphology. Perhaps this is due to the fact that much of the work which lay ready to hand and easy to accomplish has been done. But in the special branch of study which Wallace himself set going—the inquiry into the local variations, races, and species of insects as evidence of descent with modification, and of the mechanisms by which that modification is brought about—there is still great work in progress, still an abundant field to be reaped. In this country the discoveries of Wallace, Bates, and R. Trimen are being extended by many workers, chief among whom are Edward Poulton, Hope Professor in the University of Oxford, and the group of students which he has gathered around him. It is natural that the gradual and steady growth of the results of such inquiries should attract less general attention than some of the efforts to establish a new line of attack upon the problems of Variation and Heredity. Naturally enough, many have been ambitious to make such new departures, and have met with varying successes.

Several able observers and experimenters have set themselves the task of improving, if possible, the theoretical structure raised by Darwin and Wallace. One of the earliest of these was Dr. George Romanes, whose views on physiological selection and on instinct were communicated by him to this Society, but have not successfully held the field. Later we have had the doctrine of mutation advocated on a somewhat unsatisfactory basis of fact by Professor de Vries, and the resuscitation and development of the observations and

conclusions of the Abbé Mendel on pre-potency. These have all been the outcome of earnest and serious work, and have led and are leading to more complete knowledge of the facts of heredity and variation. But I venture to express the opinion that they have, none of them, resulted in any serious modification of the great doctrine submitted to the Linnean Society on July 1st, 1858, by Charles Darwin and Alfred Russel Wallace. Not only do the main lines of the theory of Darwin and Wallace remain unchanged, but the more it is challenged by new suggestions and new hypotheses the more brilliantly does the novelty, the importance, and the permanent value of the work of those great men to-day commemorated by us, shine forth as the one great and epoch-making effort of human thought on this subject.

The President: A number of Universities and Schools have kindly sent representatives to this meeting. As our time is limited and it is impossible to have the pleasure of hearing speeches from all these delegates, we have asked Dr. Francis Darwin and Sir William Thiselton-Dyer to speak for them.

Dr. Francis Darwin, F.R.S., F.L.S.: I beg leave to thank you, Mr. President, in the names of the Universities and Schools which are here represented, for giving us the opportunity of sharing in the memorable ceremonies of to-day. The University of Cambridge, which I have the honour to represent, is glad to be associated with other bodies devoted to the advancement of learning on such an occasion as this, when a signal honour is paid to one of her greatest sons. We are also proud to be allowed to pay our personal homage to the survivor of those great twin brethren of July 1st, Mr. Wallace. In spite of what he has said this afternoon—or perhaps almost in consequence of it—I cannot help thinking that not the smallest of his merits is to have taught the world once and for all how the search after scientific truth may be informed and glorified by the spirit of chivalry. We, the representatives of the Schools and Universities, are also proud to be present when the

distinguished medallists are decorated. These men, who were personal friends or disciples of Charles Darwin, we delight to see honoured; and if I may venture to mention one name amongst the medallists after Mr. Wallace, I should like to say what deep satisfaction it gives to men of science, both those who are present and those who all over the world will learn the fact to-morrow—to see that Sir Joseph Hooker has been able to be present and to address us this day.

It is customary to speak of Charles Darwin as a son of Cambridge University, but in duty bound I must begin by claiming him as a son of Christ's College. I think it would be interesting to consider for a moment what these two institutions, Christ's College and the University, did for him. As regards the College, it provided him with a home, wholesome and cheerful, for three years. How much he learned at Christ's College appears a little doubtful, and from some stray references in the 'Life and Letters' to the senior tutor and the College lecturers, I do not think it would be a profitable enquiry to try and make out how much he was taught by the College. But one thing he did learn there, and that was to love that College which many a man before and after him has loved—and that, I think you will agree with me, is worth learning.

Then as to what the University did. The University began by insisting upon his relearning Greek, which in the free and congenial atmosphere of Edinburgh University he had forgotten even down to the greater part of the alphabet. I am sorry to say that the method of degrading an ancient and beautiful language into an instrument of torture for science students still reigns at Cambridge. Then his University made him learn Paley and Euclid, and in these authors—now partially extinct—he found some edification. If it was to Edinburgh University that he owed his introduction to the paths of research, which I gladly acknowledge, it is nevertheless to Cambridge that he owed the best thing that any University can give to any student, I mean a teacher fit for him. In Professor Henslow he had such a man—

a man of a very remarkable combination of qualities, a man of serenity, with the fire of enthusiasm within him, a man with a stern sense of duty, and of the most lovable and charming manner. It is not wonderful then that a man so gifted should have had so great an influence upon him. Professor Henslow did not make any great discoveries in science, but he discovered one thing, namely, the fact that Charles Darwin had a mind worthy of cultivation. That was a fact that somehow or other escaped the notice of Dr. Robert Darwin, and also I am afraid of some other people at Shrewsbury. We all know that Henslow did much to form that mind and did much to give him the chance of his lifetime in the *Beagle* voyage; and Charles Darwin never forgot the debt of gratitude that he owed to Henslow, whom he used to speak of as his "dear old master." But I am afraid that he was somewhat ungrateful, or that he forgot the debt of gratitude he also owed to the University that gave him that master. He ought to have remembered, being a Cambridge man, the motto, *Qui facit per alium facit per se.* On the strength of that motto I think Cambridge may claim the glory of having trained Charles Darwin.

I wish to say a few words in my private capacity, as to my father's relations with this Society. I think the Linnean was the only Society except the Geological for which he had a personal feeling. He had of course that loyalty and respect for the Royal Society which all her Fellows feel. But with the Linnean there was a closer bond. It is a melancholy fact that he only sent one paper to the Royal Society for publication, while the volumes of the Linnean Society are full of some of his very best work, such things as the papers on Orchids, on Dimorphic Plants, Climbing Plants, and so on. It was in the course of this long series of publications that the mutually pleasant relationship with this Society grew up, which was to my father a source of real satisfaction.

Finally, I beg leave, in the name of the assembled

Universities and Schools, to offer our respectful congratulations to the Linnean Society on this great occasion, and especially, Mr. President, to congratulate you on the just pride you must feel in occupying an historic chair on a memorable day.

Sir William Thiselton-Dyer, K.C.M.G., F.R.S., F.L.S.:

Mr. President, the Universities for which I have the honour to speak include the most ancient in our country as well as the youngest. But they are all animated with a common sympathy in this celebration, and the reason is not far to seek. It is the happy fortune of Universities to stand withdrawn from the stress of ordinary life. They are the depositories, in some sort indeed the guardians, of what is most significant in the ideas of each successive time. They can trace the relations of those ideas with the past; they can apply them fruitfully to the problems of the present; they can conjecture their possible development in the future.

Fifty years ago this Society was privileged to be the recipient of communications which contained as Helmholtz has said "an essentially new creative thought." It would be difficult to specify any field of academic study which it has not influenced more or less, though perhaps in some cases scarcely consciously. The presence of the representatives for whom I speak, is a recognition of the profound change which has been brought about in our outlook on the natural world. Of the full measure of that change we are even now not fully sensible. The end is not yet.

Dr. Wallace, with that splendid modesty of which we have had a further proof to-day, has claimed for Darwin that he is "the Newton of Natural History." Their graves lie side by side at Westminster and the comparison is just. It is the singular fortune of an illustrious University that of two of its sons, one should have introduced a rational order into the inorganic and the other into the organic world. Each great generalisation is in fact the complement of the other, and who can say that the future may not have in store for us

some greater generalisation which may include them both.* There is this in common between them, that each is based on a fundamental assumption which it accepts from experience and leaves unexplained. Newton started from gravitation as Darwin did from variation. And if the latter is less obvious than the former, its recognition is at least as old as Lucretius.

Dr. Francis Darwin has told us that apart from the ordinary influences of University life, the mere routine of academic study did little if anything for his father. Dr. Wallace is one whom many Universities have delighted to honour, yet has been the *alumnus* of none. Those, however, are mistaken who think that the instruction of students is the sole purpose of a University. Its true function, as I have said, lies far deeper. Both Darwin and Wallace owed to Cambridge the first impulse to their thoughts. For both have told us in almost identical terms that they found it in Malthus. A fellow of a Cambridge College whose life was uneventful, his "Essay on Population" was received with a storm of execration. Yet we now know that it simply

* [Note]—Since this was written the remarkable Obituary Notice of Lord Kelvin prepared for the Royal Society by Professor Larmor has come into my hands. He contrasts the work of Lord Kelvin with that of Darwin and Wallace. The first "established the cardinal principle of inanimate cosmic evolution, as effected through the degradation of energy, which determines the fate of worlds, and is the complement of the principle of evolution in organic life which came to light at about the same time" (p. lxxv). It is certainly a striking circumstance that almost simultaneously the study of inanimate and animate nature should have been revolutionised by the discovery of a new controlling principle in each. In another passage Professor Larmor points out that between them "there is something in common; the automatic evolution towards improved adaptation, in this case with no limit or equilibrium yet in sight, is attained at the cost of compensating dissipation, namely the destruction of the individuals that happen to be ill-adapted, even though in other respects superior" (p. xxxvi). I may hazard an even closer analogy. Animate nature by selective action escapes the final equilibrium which is 'death.' Inanimate nature would equally escape it if Maxwell's 'Sorting demons' were available.

embodied the fundamental principle of the "Struggle for Existence," which everywhere stares us in the face. There Malthus stopped: it required "the flash of inspiration," which has been spoken of to-day, to see that the necessary consequence was the "Survival of the fittest."

The thought of each age is the foundation of that which follows. Darwin was an admirer of Paley, a member of his own College. He swept in the whole of Paley's teleology, simply dispensing with its supernatural explanation. John Ray, another distinguished son of Cambridge, and perhaps the greatest naturalist of his time, took the first step towards a natural classification of plants. We now know that what he and those who followed him were unconsciously striving after was the principle of descent which Darwin established.

Fifty years ago, Darwin and Wallace revealed two things to us. They gave the world a rational explanation of the evolution of living forms by descent. Of this it had long been expectant but could not find the "how." Natural selection was "the new creative thought." We now recognise it as an influence, inevitable and inexorable, which pervades us like gravitation. As Professor Karl Pearson has said, it is "something we run up against at once, almost as soon as we examine a mortality table." For the analysis of such a table shows "a selective death-rate." It is the continuous adjustment of the organism to its surroundings, in the widest meaning of the words, as a condition of its existence. Its operation makes for complexity, for it is irreversible and builds on what has preceded. Yet it is not identical with progress, for, as Huxley pointed out, that "which survives in the struggle for existence may be, and often is, the ethically worst." But whether it makes for perfection or degeneration, natural selection, slowly and unobserved, is incessantly at work moulding the face of organic nature.

The following representatives of Universities, Colleges, and Schools, were then received by the President, many of the representatives presenting Addresses. The first three were the College and Schools connected with the early training of Darwin and Wallace, namely:

Christ's College, Cambridge (Dr. Peile, F.B.A., Master).

Shrewsbury School (Mr. C. J. Baker, Chief Science Master).

Hertford Grammar School (Mr. G. W. Kinman Head-Master).

Then came the following Universities and Colleges:

The University of Oxford (Dr. T. H. Warren, Vice-Chancellor of the University).

" " (Prof. E. B. Poulton, F.R.S., F.L.S.).

" " (Dr. A. H. Church).

The University of Cambridge (Dr. Francis Darwin, F.R.S., F.L.S., handed in the following letter under seal of the University):—

Registry of the
University of Cambridge.
29th May, 1908.

To

The President *of the* Linnean Society of London.

Sir,

I have the honour to inform you that the Senate of this University at a Congregation held in the Senate House on Thursday, 14th May, 1908, appointed:

Francis Darwin, Master of Arts, of Christ's College,

to represent the University at a meeting convened by the Linnean Society of London to be held in July 1908, in

celebration of the fiftieth anniversary of the reading of the joint Essay by Charles Darwin and Alfred Russel Wallace, "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection."

I have the honour to be, Sir,

Your obedient Servant,

(L. S.) (Signed) JOHN WILLIS CLARK,
Registrary of the University.

THE UNIVERSITY OF ST. ANDREWS (Prof. P. R. Scott Lang, M.A., B.Sc.),

with the following address:—

THE UNIVERSITY OF ST. ANDREWS appreciates highly the honour of being invited by the Linnean Society of London to join with it in celebrating the jubilee of the reading of the joint essay by Charles Robert Darwin and Alfred Russel Wallace, "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection."

During the fifty years that have since elapsed the views promulgated on that day have given a vast impulse to the study of Natural History, both by observation and experiment, with a corresponding advance in the knowledge of Biology. Nor has their influence been confined to this science; it may be said to have largely affected the methods and the spirit of investigation in many, if not in all, Departments of Study.

It is an additional ground for congratulation that one of the illustrious heroes of that day is still with us, and it is our hope that he may long be spared to behold the wonderful development of the ideas to which he gave birth, and has been himself so great a contributor.

We are pleased to think that in the course of its long

history this University has not altogether failed to contribute to the advancement of the Sciences more directly connected with this joyous occasion. We call to mind that one of our Students, Sir Andrew Balfour, after studying Natural History and Medicine at St. Andrews two hundred and fifty years ago, was later in his life the Founder, at Edinburgh, of the first Botanic Garden in Scotland, where in a short time he had in cultivation, from seeds obtained from Blois, Paris, and elsewhere, more than one thousand species. This is now represented there by the celebrated Royal Botanic Gardens in which the great Darwin doubtless studied. In the sister science of Zoology, St. Andrews, alone of all the Scottish, or even the English Universities, is equipped in its Gatty Marine Laboratory with unrivalled facilities for the study of marine fauna. Nor can we forget that the "Vestiges of Creation," the principal forerunner and poineer of the views of Darwin and Wallace, was written in St. Andrews by one of her most distingnished citizens.

We earnestly trust that this occasion, great and memorable as it is in the history of the Linnean Society, will be but the beginning of a new era of advancement and usefulness.

(Signed) James Donaldson.
(*Principal and Vice-Chancellor of the University.*)

The University, St. Andrews, June 1908.

L. S.

The University of Glasgow (Prof. John Graham Kerr, M.A., F.L.S.).

The University of Aberdeen (Lieut.-Col. Prain, C.I.E. F.R.S., F.L.S.)

presented the following address:—

To the President and Council *of the* Linnean Society of London *on the occasion of the 50th Anniversary of the memorable Meeting of 1st July*, 1858.

The University of Aberdeen, in accepting the invitation of the Council of the Linnean Society of London to send a delegate to the Jubilee Meeting on the first of July, desires to convey, through its representative Lieut.-Col. David Prain, C.I.E., M.B., LL.D., F.R.S., its cordial felicitations, and to express its sympathetic interest in the historical commemoration of the Meeting of July 1st, 1858, when Charles Darwin and Alfred Russel Wallace read their ever memorable joint essay. In the University of Aberdeen, as in every other seat of learning and research throughout the world, the influence of that Meeting has been for half a century a stimulus to interpretation and investigation in many different fields, and it is with gratitude that the University desires to share in commemorating what must always be regarded as one of the greatest days in the history of science. The University joins in congratulating Darwin's magnanimous colleague Alfred Russel Wallace—the doyen of Biologists,—the Nestor of the Naturalists' Camp,—that he has lived to see the 50th Anniversary of the great achievement in which he shared; and in congratulating the Linnean Society on the part that it has played in furthering the progress of biological science and evolutionist interpretation.

(Signed) John Marshall Lang, C.V.O., D.D., LL.D.,

23rd June, 1908. *Principal of the University of Aberdeen.*

The University of Edinburgh (Prof. I. B. Balfour, F.R.S., F.L.S.)

presented the following address:—

To The Linnean Society of London.

1st July, 1908.

The Senatus Academicus of the University of Edinburgh joins heartily with the Linnean Society of London in celebrating the fiftieth anniversary of the communication to the Society, and thus to the world, of the conception arrived at independently by the two master minds of Darwin and Wallace—of the influence of "Natural Selection" on the "Perpetuation of Varieties and Species."

The concept was no ordinary contribution to the interpretation of the orderly advance of the organic universe. Under the dominating genius and untiring experimental research of Darwin the truth of Natural Selection as one of the powerful factors in evolution was established and remains to us; but this fact is not the measure of the value of the first idea and after demonstration. There was here the germ of a revolution in human thought, and the debt we owe to Darwin and Wallace is that their thought and work, more particularly the thought and work of Darwin, have brought about within the period the close of which is fitly marked to-day, our emancipation from the trammels of scholasticism and the recognition of evolution previously unheeded—as the normal process in the world organic and inorganic. The cordiality with which the Senatus Academicus supports the Linnean Society on this occasion is enhanced by the circumstance that Charles Darwin was an alumnus of the University of Edinburgh.

(Signed) W. Turner, *Principal.*

(Signed) L. J. Grant, *Sec. Sen. Acad.*

The University of Dublin, Trinity College (Prof. H. H. Dixon, D.Sc., F.R.S.).

The General Secretary explained that Prof. H. H. Dixon, who was to have represented the University of Dublin, had

arrived in London, but was too unwell to be present; the Address, however, had been forwarded for presentation, as follows:—

ADDRESS OF THE UNIVERSITY OF DUBLIN

TO

THE LINNEAN SOCIETY OF LONDON.

The University of Dublin accept gladly the invitation of the Linnean Society of London to participate in the celebration of the fiftieth anniversary of the publication of the epoch-making work of Darwin and Wallace.

The fearless speculations of these Thinkers, controlled by laborious investigations, have inaugurated a new era in Biological Thought; and the Linnean Society, by the publication of their work, and by its uniform action in fostering the spirit which animated their researches, has contributed largely to the mental development of mankind.

The University of Dublin desires to avail itself of this occasion to congratulate the Linnean Society on the work it has already achieved, and to express the earnest hope that the Society may long continue to discharge its great functions, and that it may have the privilege of making known to the world the researches of Darwins that are to be.

(Signed) Rosse,

Chancellor.

The University of Durham (Prof. M. C. Potter, F.L.S.).

The University of London (Sir W. T. Thiselton-Dyer, K.C.M.G., F.R.S., F.L.S.),

with the following address:—

TO

THE PRESIDENT AND COUNCIL

OF

THE LINNEAN SOCIETY OF LONDON.

GENTLEMEN,

I am directed by the Senate of the UNIVERSITY OF LONDON to convey to the Linnean Society of London their congratulations on the 50th anniversary of the day upon which Charles Darwin and Alfred Russel Wallace communicated to the Society the results of their investigations on the Origin of Species of Animals and Plants. As it recedes into the past, the far-reaching importance of the event which the Society is celebrating becomes more and more manifest. The doctrine of Evolution has touched every branch of human thought and has influenced the course both of intellectual advance and of material progress.

Amongst the distinguished naturalists who are members of the Linnean Society many Graduates of the University are to be found. United to the Society, not only by these bonds of common membership but also by the common desire to advance the cause of learning and to enrich the stores of human knowledge, the Senate rejoice to join with you in the celebration of this historic day.

(Signed) ARTHUR W. RÜCKER,

July 1st, 1908. *Principal.*

THE UNIVERSITY OF MANCHESTER (Prof. F. E. Weiss, D.Sc., F.L.S.),

with the following address:—

THE VICTORIA UNIVERSITY OF MANCHESTER.

THE UNIVERSITY OF MANCHESTER begs to offer to the Linnean Society of London its congratulations on the occasion of the anniversary of the joint presentation to that Society of the papers of Charles Darwin and Alfred Russel Wallace, setting forth their theories of the Origin of Species.

These new views first enunciated at the meeting of the Linnean Society have not only transformed and stimulated the study of the Biological Sciences but have revolutionised every sphere of thought.

Whilst congratulating the Linnean Society on so distinguished an event in its annals, the Manchester University wishes to express its hope for the continuance of the signal successful labours of the Linnean Society in encouraging and promoting the study of Biological Science.

THE UNIVERSITY OF WALES (Prof. R. W. Phillips, D.Sc., F.L.S.).

THE UNIVERSITY OF BIRMINGHAM (The Vice-Chancellor, Sir Oliver Lodge, F.R.S.).

THE UNIVERSITY OF LIVERPOOL (Prof. Herdman, D.Sc., F.R.S., F.L.S.),

with the following address:—

ADDRESS

FROM

THE UNIVERSITY OF LIVERPOOL

TO

THE LINNEAN SOCIETY OF LONDON

ON THE OCCASION OF

THE DARWIN-WALLACE CELEBRATION,

July 1st, 1908.

A YEAR ago the Linnean Society took part with other similar Scientific Societies throughout the civilised world in celebrating the 200th anniversary of the birth of the distinguished Swede CARL VON LINNÉ, who may be said to have laid the foundations of modern Botany and Zoology. This year the Society asks others to join with her in rejoicing at the Jubilee of a still greater event in the history of Science—the birth of a movement which has revolutionised Biology, and has extended far into other fields of thought.

If the work of Linneus, in 1758, introduced order and method into the classification of living nature, the Darwinian theory of Natural Selection, exactly a century later, gave rational explanation of the order, and grouped the Linnean facts into a consistent Scheme of Evolution.

There has probably been no more inspiring idea in the history of Natural Science than that contained in the joint essay by Charles Darwin and Alfred Wallace read before the Linnean Society on July 1st, 1858; and all who understand and honour Science will wish to rejoice with the Society that made known to the world the work that has since become the foundation of Darwinism.

The University of Liverpool is post-Darwinian in history and evolutionary in development. In association with other more venerable and more renowned, but not more appreciative bodies, scientific and educational, this University desires to congratulate the Linnean Society upon the present Darwin-Wallace Celebration, to thank the Society for the leading part it has played during one hundred and twenty years in advancing knowledge and in proclaiming the discoveries of science, and to express the hope that the present Jubilee may be of historic importance as marking the beginning of new service and success.

(Signed) E. K. Muspratt,
President.

(Signed) A. W. W. Dale,
Vice-Chancellor.

The University of Leeds (Prof. V. H. Blackman, D.Sc., F.L.S.).

The University of Sheffield (Prof. Denny, F.L.S.).

University College, Nottingham (Prof. J. W. Carr, F.L.S.).

University College, Bristol (Prof. C. Lloyd Morgan, F.R.S.),

with the following address :—

FROM THE

COUNCIL AND SENATE

OF

UNIVERSITY COLLEGE, BRISTOL,

TO

THE LINNEAN SOCIETY OF LONDON

ON THE OCCASION OF

THE DARWIN-WALLACE CELEBRATION,

July 1st, 1908.

The Council and Senate of University College, Bristol, beg to offer to the Linnean Society their sincere congratulations on the Fiftieth Anniversary of the presentation of the paper on Natural Selection by Charles Darwin and Alfred Russel Wallace. They desire also to assure Dr. Wallace of their deep sense of the value of his splendid work in the cause of Science.

The communication of the joint paper with its attendant circumstances and consequent results marks an epoch in the history of thought and is in many ways a matter of far-reaching human interest. The Darwin-Wallace Celebration commemorates not only a great intellectual achievement, but also one of the best examples of modesty and magnanimity of men of true genius.

For upwards of a century the Linnean Society has exercised a wide and beneficent influence on the Advancement of Science. The Council and Senate confidently anticipate that the Society will long continue to carry on its work with distinction and success.

(Signed) Lewis Fry,
(*Chairman of Council*).

(Signed) C. Lloyd Morgan,
(*Principal*).

The President: We have a considerable number of Academies and Societies who have done us the honour to send representatives, and we shall have to proceed in the same manner in their case as in that of the Universities, and ask two representatives to be kind enough to speak on behalf of the whole number, Professor Lönnberg and Sir Archibald Geikie.

Professor Einar Lönnberg said :—

Mr. President,

My gracious Sovereign, H.R.M. King Gustaf of Sweden, has kindly ordered me to bring to the Linnean Society his hearty greetings and sincere felicitations on this occasion, when you celebrate the memory of one of the most important events in the history of Science.

Mr. President,

Next you will kindly allow me to tender to you the address which the Royal Swedish Academy of Science has resolved to present to you. It reads :—

To The Linnean Society of London.

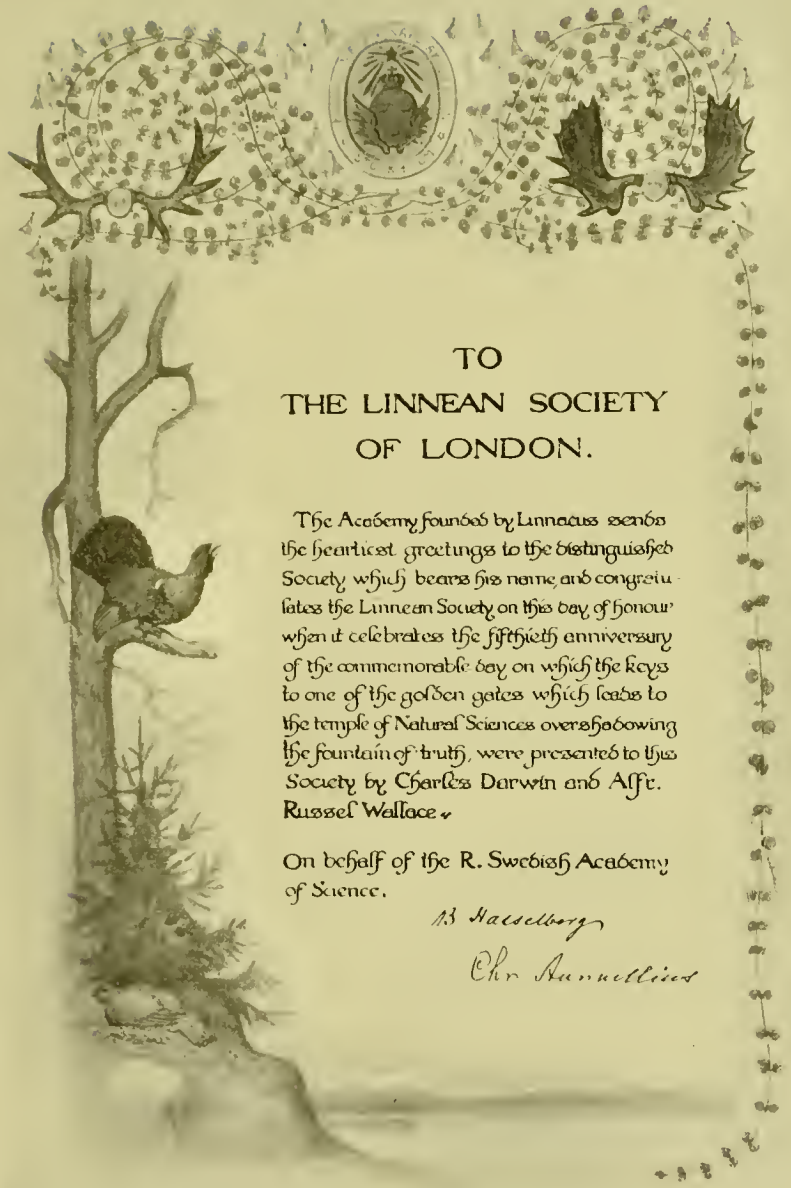
The Academy founded by Linnæus sends the heartiest greetings to the distinguished Society which bears his name, and congratulates the Linnean Society on this day of honour when it celebrates the fiftieth anniversary of the commemorable day on which the keys to one of the golden gates which leads to the temple of Natural Sciences overshadowing the fountain of Truth, were presented to this Society by Charles Darwin and Alfred Russel Wallace.

On behalf of the Royal Swedish Academy of Science.

(Signed) B. Hasselberg.
[*President.*]

(Signed) Chr. Aurivillius.
[*General Secretary.*]

When I stand here before you, I dare to say, I am not only speaking by the order of my King, and as a Member



TO
THE LINNEAN SOCIETY
OF LONDON.

The Academy founded by Linnaeus sends the heartiest greetings to the distinguished Society which bears his name, and congratulates the Linnean Society on this day of honour when it celebrates the fiftieth anniversary of the commemorable day on which the keys to one of the golden gates which leads to the temple of Natural Sciences overshadowing the fountain of truth, were presented to this Society by Charles Darwin and Alfr. Russel Wallace.

On behalf of the R. Swedish Academy of Science.

A. G. Hazelborg

Chr. Aurivillius

of the Royal Swedish Academy of Science, but as a representative of the whole Swedish Nation, and I want to express our gratitude towards British Science and British men of Science for everything we have obtained from you during a most friendly intercourse for centuries.

It is generally conceded that the Swedes, Linnæus and Artedi, by their classification according to logical principles and their firm nomenclature, have founded the modern Natural Science. Both, however, most willingly admitted that they had learned much from their British predecessors "nobilissimum Willughbejum" and "clarissimum Rajum." Both Artedi and Linnæus, who inaugurated the new era, had also the opportunity of personally visiting Great Britain, and they not only widened their knowledge here, but at the same time they received a very congenial welcome from the great British scientists of those days, men such as Sloane (then President of the Royal Society), Dillenius the renowned Professor at Oxford, and many others. Artedi had not words strong enough to praise "nobilissimam gentem Anglicam" with which he had spent some of the happiest days of his short life. And when Linnæus left Great Britain he returned to his great *British* Mecænas, Clifford, who not only most munificently assisted Linnæus, but also made science for ever indebted to him by resuming and offering for publication the unfortunate Artedi's extremely valuable manuscripts.

To this distinguished Society the Swedish nation most especially owes its gratitude for the pious care with which it has kept the collections, books, and manuscripts of Linnæus, which, when they by the power of circumstances were carried from Sweden, could not have fallen in better hands, as everybody readily admits.

This friendly traffic between Great Britain and Sweden, began in the dawn of Natural Science, continued by the scholars of Linnæus—one of whom, Solander, remained in this country—has been kept up ever since, to which, no doubt, some of the present scientists can testify. I hope this has been to mutual benefit, although, naturally enough,

the mighty can do more than the weak, the rich give more than the one of smaller means.

The greatest and most valuable gift which British Science has given, not only to the Swedish nation but to the world, is, however, the one which is celebrated to-day.

Great thinkers and naturalists have repeatedly expressed their ideas concerning the evolution of the organic world. Erasmus Darwin spoke about a gradual transformation and adaptation to surroundings. Still more powerful was Lamarck's genial theory about the influence of use and non-use of the organs. Other scientists have expressed different opinions; but first by Charles Darwin and Alfred Russel Wallace was the theory of evolution firmly founded, and on this foundation a mighty structure erected. Since Linnæus about a century earlier presented to an admiring world his 'Systema Naturæ,' no naturalist has spoken more powerfully to his contemporaries than these two authors. But while 'Systema Naturæ' inspired a till then unknown zeal in the study of nature, the theory of evolution extended its enlivening influence to the dominions of all human sciences. For this theory has not only effected a new development of the natural sciences, but it has given better and truer methods of research to other sciences as well, and thus invigorated them to a new and better life.

As by the great genius of Darwin and Wallace evolution has proved to be not only a doctrine but a fact—even if different opinions may be held about its ways and means, and even if some of their followers have shot beyond the mark—the whole educated world is willing to pay its homage on this day.

I fear that no word in praise of Darwin could be said which has not been repeatedly uttered before (even to-day much has been said and will be said by worthier men than the present speaker). It would, however, be gratifying to me if I could, by reciting a small incident, prove to this distinguished audience in how high esteem this great genius has been and is held in my own country. Some twenty years ago, when the question arose about erecting a memorial

monument to Darwin, the honour was admitted to Sweden as well as to other civilised countries, to partake in the subscription for this aim. Leading Swedish scientists then sent out a circular in which the public was informed about the intention of the subscription and reminded how "the extensive knowledge, the depth of penetration, the incorruptible love of truth, the humble courage which make themselves felt in all Darwin's works, have everywhere won for him the highest esteem, and far and near in the different fields of science called forth zealous workers inflamed by his spirit" The result of this subscription, I am proud to say, was that although Great Britain naturally enough was far ahead, among all others the small Swedish nation was the second.

The same spirit still rules among us, and it is therefore with deepfelt gratitude that we offer our humble homage on this day.

The President: I am sure we shall wish to acknowledge with a deep sense of the honour done to us, the very gracious words of the King of Sweden which he has transmitted quite unexpectedly to the Society on this occasion. I also think we feel that some special expression of our thanks is due to Professor Lönnberg, not only for what he has said himself, but for the beautiful medal of Linnæus he has just presented to us.

Sir Archibald Geikie, K.C.B., representing the Royal Society, said:—

Mr. President, Ladies and Gentlemen,

At this late hour, with so much still before us, I feel sure I shall best consult the comfort and convenience of the audience by being brief. I represent the Royal Society, and I also am asked to speak on behalf of the various other learned Societies and scientific Institutions of the country which are here represented. I am sure that I express the hearty sympathy of every delegate here. We rejoice that the Linnean Society has had the happy inspiration to hold this jubilee to-day. It will meet with a warm response

in every Society in this country and abroad where natural science is cultivated. With regard to Charles Darwin's connection with scientific Societies, we have heard that he had a very great respect for the Royal Society, but that he found perhaps an even more congenial home in the Linnean and the Geological. I can speak for the Geological. We treasure amongst our great classics in the volumes of our 'Transactions' and 'Proceedings' some of the early papers of Darwin which mark an epoch both in his scientific researches and in the development of geological science. In treasuring these memoirs, we look back with peculiar gratification on the surroundings in which their author was then placed. He was for some time our Secretary, and we have references, in his own handwriting, to the active part he took in our work. With regard to Dr. Wallace, the Geological Society has less to say because he has lived most of his life as a working naturalist, and his suggestive contributions to geological science have been published elsewhere. But we admire his genius and not less his chivalrous, modest disinterestedness, and after the revelation he has given us of his character to-day we shall not only admire but love him. The time of appraising the relative merits of these two men has long since passed. We rejoice that they were both connected together in the launching of the great doctrine of natural selection on the same day, and we rejoice still more that one of them is present with us here to be a witness of the enthusiasm and veneration with which his name is received. I remember well when the two conjoint papers first came out. I can recall the shiver that ran through the frames of the orthodox geologists and biologists of the time. I remember the heart-searchings and misgivings with which the new doctrine was received, and the long time that elapsed before many of us undertook to investigate and apply the new doctrine. There was plenty of carping and fault-finding, but very little serious reflection or study. Travelling in Germany some years after the appearance of the 'Origin of Species' I was astonished to find there that, while men in this country were discussing

whether or not Darwin's views could be accepted, Darwinism had already been established as the starting point of many branches of science. I found, moreover, that not only did the Darwinian doctrine pervade the scientific world, but that it had also entered into the political world. A few years after the disaster at Königgrätz, I was told at Vienna, that when the Austrian Parliament, at that great crisis in the fate of the empire, met to consider what steps should be taken for the re-consolidation of the Monarchy, a very distinguished member of the Upper House began a famous speech by the remark, "The first thing we have to consider is: Is Charles Darwin right or is he not?"—and upon the rightness of Darwin's theory it was gravely proposed to reconstruct the Austrian Monarchy. Times have changed since then. We in this country are now quite abreast of other countries in our recognition of the enormous extent to which Darwinism and the theory of evolution have pervaded all branches of human thought. And yet, great as that permeation has been, we are evidently only at the beginning of the applications of the theory.

I must bring my brief remarks to a close by again assuring, you, Sir, as President, and the Fellows of the Linnean Society, that you have the heartfelt sympathy of all the learned Societies and Institutions of this country, who desire to rejoice with you in the happy thought that prompted you to celebrate this great jubilee.

The following representatives were then received in succession by the President :—

The Society of Antiquaries (The Lord Avebury, P.C., F.R.S., F.L.S.),

with the appended address :—

29th June, 1908.

The President and Council of the Society of Antiquaries of London desire to convey to the President and Council of the Linnean Society their fraternal greetings on the

auspicious occasion of the speeial meeting to commemorate the fiftieth anniversary of the reading of the joint essay, "On the Tendency of Speeies to form Varieties, and on the Perpetuation of Varieties and Species by natural means of Selection," by the late Charles Darwin and Alfred Russel Wallace, who is still happily with us.

The inspiration which that essay gave to the students of natural science has since extended to almost every domain of human knowledge, and is felt by those who devote themselves to the study of Antiquity and the history of former times. The Society of Antiquaries, therefore, desires to associate itself with those bodies which are more directly concerned with the study of natural history in congratulations on an event to whieh the scientific advances of fifty years are largely due.

(Signed) Charles Hercules Reade,
President.

The Royal Irish Academy (Dr. R. F. Scharff, F.L.S.).

The Manchester Literary and Philosophical Society (Mr. C. Bailey, M.Sc., F.L.S.).

The Royal Society of Edinburgh (Prof. D'Arcy Thompson, C.B., F.L.S.)

presented the following address :—

The Royal Society of Edinburgh,
30th June, 1908.

The Royal Society of Edinburgh sends Greetings to the Linnean Society of London on this the happy oeeasion of the Darwin-Wallace Anniversary Celebration.

Founded in the name of the Great Founder of Systematie Botany and Zoology, and giving equal heed to these twin Natural Sciences, it was meet and fitting that the Linnean Society should inaugurate the birth of a new Philosophy of Nature.

Honoured for the honour that she paid to this new

learning, distinguished by the zeal with which she has promulgated and advanced it, may the Linnean Society accept from the Royal Society of Edinburgh these present fraternal congratulations, and these our best wishes for her lasting honour and prosperity.

In the name of the Royal Society of Edinburgh,

(Signed) D'Arcy W. Thompson,
Delegate.

The Geological Society of London (Mr. W. H. Hudleston, F.R.S., F.L.S.).

The Cambridge Philosophical Society (Dr. S. F. Harmer, F.R.S.).

The Royal Astronomical Society (The President, Mr. H. F. Newall, F.R.S.).

The Zoological Society (Mr. G. A. Boulenger, F.R.S.).

The British Association (The President, Sir David Gill, K.C.B., F.R.S.).

The Entomological Society of London (The President, Mr. C. O. Waterhouse).

The Royal Microscopical Society (The President, The Lord Avebury)

presented an address as follows :—

Royal Microscopical Society,
20 Hanover Square, London, W.,
July 1st, 1908.

The Royal Microscopical Society in the presence of its President, the Lord Avebury, desires to be associated with other Scientific bodies in the congratulations on the event the Linnean Society is now celebrating in commemoration of the 50th anniversary of the reading of the joint essay by Charles Robert Darwin and Alfred Russel Wallace, On the Tendency of Species to form Varieties, and on the Perpetuation of Varieties and Species by Natural Selection.

The publication of that Essay gave an immense stimulus

to the study of Biology, and marks an epoch in the progress of that Science.

The Royal Microscopical Society desires to convey its hearty good wishes for the prosperity of the Linnean Society and hopes it may long flourish to the great advantage of Biology and the progress of Science generally.

(Signed) Avebury.

The Chemical Society (Dr. Horace T. Brown, F.R.S., F.L.S.).

Mr. A. E. Shipley, F.R.S., F.L.S., representative of the Marine Biological Association, unfortunately was unable to arrive at the Meeting in time to take part, being detained by his duties as Examiner at the University of Liverpool.

And

The Malacological Society (Mr. R. H. Byrne, F.Z.S.).

The British Academy (Sir E. Maunde Thompson, K.C.B., President) presented the following address :—

At a Meeting of the Council of the British Academy held on the 27th of May, the President, Sir Edward Maunde Thompson, K.C.B., was appointed to represent the Academy at the Darwin-Wallace Celebration of the Linnean Society of London.

The President of the British Academy has the honour to express to the Linnean Society the heartiest good wishes and sympathetic congratulations of the British Academy on this auspicious occasion.

(Signed) E. Maunde Thompson,
President of
The British Academy.

1st July, 1908.

The President: It now remains for us to have the pleasure of hearing the address which Lord Avebury is good enough to give us.

The Rt. Hon. Lord Avebury, P.C., then delivered the following Address:—

I DEEM it a high honour, as it is also a great pleasure, for me to be invited to take any part in this auspicious ceremony, which is so interesting to all lovers of Science, and especially of Natural History.

After the speeches which we have just heard from such eminent representatives of the Science as Wallace, Hooker, Galton, Strasburger and Lankester, I am disposd to think that my Address might be taken as read ; and at any rate it would be a work of supererogation, and almost an act of impertinence, for me to address you on the scientific aspect of the occasion, and on the memorable paper by Mr. Darwin and Mr. Wallace the reading of which we have met to celebrate. I presume I have been asked to speak because, with the exception of Sir Joseph Hooker, I have been more personally associated with our illustrious Countryman than any one else now living. I first heard his name in 1842—66 years ago, when my father returned one evening from the city, and said he had a great piece of good news for me ; Mr. Darwin was coming to live close to us at Down, which he has rendered so famous.

Darwin chose Down (happily for us) for the "extreme quietness and rusticity of the place." Huxley has described it as "a solitary hamlet." It is at an elevation of 600 feet, on the uplands as its name denotes. There is a local saying about Down and the next village Cudham, which is quite a large parish, that "Down is the last village in the world, and Cudham is the first one out of it. There never yet has been a lawyer or a doctor or a clergyman or a gentleman or a well, in the parish of Cudham." And yet the Church is only 16 miles from London Bridge !

In Down Mr. Darwin was much loved. He took an active part in parish work. Our then clergyman was a wise and sensible man. He and Mr. Darwin, though they thought so differently, always worked together, and were firm friends. Mr. Darwin was no doubt something of a puzzle to the villagers, though he was not, like his grandfather, looked on as a Necromancer. One of his friends once asked Mr. Darwin's gardener about his master's health, and how he had been lately. "Oh !", he said, "my poor master has

been very sadly. I often wish he had something to do. He moons about in the garden, and I have seen him stand doing nothing before a flower for ten minutes at a time. If he only had something to do I really believe he would be better."

The Joint Memoir is the work which we have met to-day specially to commemorate, but the other labours of our illustrious countrymen fully justify the highest honours which any country could confer.

When Mr. Darwin received the Copley Medal, Sir C. Lyell was one of the speakers at the Royal Society dinner. One sentence in Lyell's speech impressed me so much that though it was fifty years ago I still have it ringing in my ears. He said: "When I was a young man propounding what seemed revolutionary ideas in Geology, I complained on one occasion to Mr. Darwin that the leaders in Science adhered so tenaciously to the old views: and Mr. Darwin replied, 'Well, let this be a lesson to you, and when you in your turn are old, remember that you keep your mind open to receive the new ideas which will assuredly come.'" "This," said Sir Charles Lyell, "I have taken to heart, but little did I think that Darwin himself would start the revolutionary ideas as to which I was to keep an open mind."

It is difficult for the present generation to realise the astonishment and indignation with which principles promulgated in the Joint Memoir and in the 'Origin of Species,' by which it was succeeded, were received. As Huxley remarked years ago, it seemed even then like a dream!

"I do not," said Huxley, "call to mind among the Biologists more than Asa Gray, who fought the battle so splendidly in the United States; Hooker, who was no less vigorous here; Sir John Lubbock and myself. Wallace was far away in the Malay Archipelago."

Huxley and Hooker were Darwin's two towers of strength in this country.

Mr. Darwin himself made (March 1860) the following classified list of those who agreed with him; I omit those who only did so partially:—

Geologists.	*Zoologists and Palæontologists.*	*Physiologists.*	*Botanists.*
Lyell.	Huxley.	Carpenter.	Hooker.
Ramsay.	Lubbock.		Watson.
Jukes.	Searles Wood.		Thwaites.
Rogers.			

And of this short list it is remarkable that, after fifty years, three are here to-day.

Authority then was mainly on one side, but truth was on the other: and when authority and truth differ, in the long run truth will prevail over authority.

It is, however, only fair to remember that on Naturalists generally the new theory burst with startling abruptness like a "bolt from the blue." Lyell, Hooker, Huxley and I, on the contrary, had been in constant communication with Darwin, and had had time to consider and weigh the argument.

Yet really it seems wonderful now that great Naturalists should have taken so long to make up their minds. As Huxley said, he had puzzled over the question and found no answer, but when the 'Origin' appeared he reproached himself "with dulness for being perplexed by such an enquiry. My reflection, when I first made myself master of the central idea of the 'Origin' was, 'How extremely stupid not to have thought of that!'"

A few years, however, brought conviction, and writing in 1878 Mr. Darwin was able to say that there was almost complete unanimity among Naturalists about the truth of evolution.

As regards the Joint Memoir and the 'Origin of Species,' no doubt the attacks of Theologians were mainly due to the belief, still widely entertained, that Evolution was incompatible with religion. Darwin, himself, never held this view. In his speech on the 22nd June at the Pan-Anglican Synod, Mr. Balfour, while expressing the opinion that the argument from design, "though I should hesitate to say it was worthless, had lost much of its old efficacy in the stress of recent biological discoveries," was of the same opinion.

In looking at the theory of Evolution, we have to ask not is it desirable, but is it true.

But if Evolution has no bearing on Theology, as regards conduct it is eminently encouraging, and the general outcome of Evolution appears to be—as Darwin himself pointed out—that those Communities which include the greatest numbers of the most sympathetic members will flourish best.

In these and other points of view, Science, and even those branches which seem to have the least practical application, are of inestimable importance.

Mr. Balfour, in the speech to which I have already referred, paid a generous tribute to Science—though, as President of the Sociological Society, I must demur to his exclusion of Sociology—saying that: "More than to the work of statesmen or to the elaboration of social systems, or to the study of Sociology, I look to Science more than anything else as the great ameliorator of the human lot in the future."

With that we here shall agree. Well, indeed, would it be for the world if the fellow-feeling which exists between men of Science to whatever nation they belong could be extended to other sections of our European Communities, and if the nations of Europe and their rulers would diminish, we cannot hope that they would abandon, their enormous military and naval expenditure, and spend a small part of the saving in the encouragement of scientific experiment and research. We pay dearly, indeed, for the hatred, jealousy and suspicions which disgrace our so-called civilisation.

The amount of work done by Darwin and Wallace was marvellous, and in Darwin's case all the more so as it was accomplished in spite of very bad health and daily suffering. It would have been impossible, but for the wise and loving care which watched over him from the time of his marriage; and every one who enjoyed the inestimable privilege of Mr. Darwin's friendship, will always look back on Mrs. Darwin also with gratitude and affection, not only for all she did for him, but for many acts of kindness to them.

Darwin, himself, was not only a great man and a great

intellect; he was also—which is after all even more—a lovable and a good man, genuine, simple, generous and sympathetic. Of few of our other greatest men can this be said.

Newton was a gigantic intellect. Of Shakespeare we know too little; of Bacon perhaps too much. Cromwell lived in times too disturbed.

But Darwin's life is all before us. I suppose he had his faults, but what were they? I knew him well, but I do not know. He was modesty itself; a true friend, a devoted son, husband, and father. Few men have been more violently attacked, more bitterly criticised, than Darwin and Wallace. That they felt all this keenly we know, but they were never goaded into anger or recrimination. They bore it with patience and dignity. They answered none of the attacks, they lived them down.

Mr. Darwin's reply to critics is contained in the memorable words with which he closes his great work:

"There is a grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that whilst this planet has gone cycling on, according to the fixed laws of gravity, from so simple a beginning, endless forms most beautiful and most wonderful have been, and are being evolved."

All over the world to-day Naturalists, and many who are not Naturalists, are with us in spirit, united in doing honour to our illustrious countrymen—Charles Darwin and to Alfred Russel Wallace, whom we have still the pleasure to see amongst us.

The President: My final duty this afternoon is the very pleasant one of asking you to return a warm vote of thanks to Lord Avebury for the Address, all too short, that he has just given us. It was felt that we could not let an occasion like this pass by without hearing something from him, because we all know that after Sir Joseph Hooker it is Lord Avebury especially, of all men now living, who was most closely associated with Darwin, and whose work was not only directly inspired by Darwin but was also carried on

in the first instance under his personal influence. Those of us who have read the 'Life and Letters' and the letters subsequently published, know what Mr. Darwin himself thought of Lord Avebury as a naturalist. He was much pleased at his conversion to the theory, and wrote as early as April 6, 1859: "My neighbour, and an excellent naturalist, John Lubbock, is an enthusiastic convert." Nothing could have been more interesting or touching than the beautiful words in which Lord Avebury has sketched the character of Darwin as he knew it, and no one knew it at closer quarters than he. I will ask you to return your thanks to Lord Avebury.

The motion was carried with acclamation.

The President: That concludes our business.

A Dinner given by the Fellows to the Medallists and Foreign Guests, was held at the Princes' Restaurant, at 6.30 p.m., Dr. D. H. Scott, F.R.S., President, in the Chair.

The following were present:—

The Lord Avebury.
The Lady Avebury.*
Sir George Darwin.*
Lady Darwin.*
Sir E. Ray Lankester, K.C.B.
Sir Daniel Morris, K.C.M.G.
Sir Frank Crisp.
Lady Crisp.
Sir Oliver Lodge.*
Prof. Strasburger, F.M.L.S.*
Dr. Galton, F.R.S.*
Prof. Warming, F.M.L.S.*
Prof. Hubrecht, F.M.L.S.*
Prof. E. Lönnberg.*
Mr. E. A. N. Arber.
Dr. Margaret Benson.
Prof. V. H. Blackman.
Mr. L. A. Boodle.
Mr. G. A. Boulenger.*
Prof. G. C. Bourne.
Dr. A. Chevalier.*
Miss E. Crocker.
Mr. A. D. Darbishire.*
Mr. O. V. Darbishire.*
Dr. Francis Darwin.
Mr. W. E. Darwin.*
Prof. Dendy.
Mrs. Dendy.*
Prof. Denny.
Mrs. Denny.*
Mr. F. V. Dickins.*
Mr. H. Druce.
Rev. E. A. Eaton.*
Mr. W. Fawcett.
Rev. H. P. Fitzgerald.
Mrs. Fitzgerald.*

Mr. D. T. Gwynne-Vaughan.
Dr. Harmer.*
Prof. W. A. Herdman.
Prof. J. P. Hill.
Dr. W. E. Hoyle.*
Dr. Daydon Jackson.
Prof. Judd.*
Mrs. Judd.*
Mr. A. W. Kappel.
Prof. J. G. Kerr.
Dr. Kidston.*
Prof. Scott Lang.*
Dr. Longstaff.*
Mr. Lydekker.*
Mr. S. Maitland.*
Mrs. S. Maitland.*
Prof. Meldola.*
Prof. Minchin.*
Mr. H. W. Monckton.
Mrs. Muff.
Mr. C. S. Nicholson.
Dr. J. Oliver.
Prof. Osler.*
Mr. Pawson.
Mrs. Pawson.*
Mr. H. Phipps.*
Mr. R. I. Pocock.
Mrs. Pocock.*
Prof. E. B. Poulton.
Mr. E. P. Poulton.*
Lt.-Col. Prain.
Dr. A. B. Rendle.
Miss Ricardo.*
Miss Sargant.
Miss E. R. Saunders.
Mr. G. S. Saunders.
Dr. D. H. Scott.
Mrs. D. H. Scott.
Prof. Seward.
Mr. A. E. Shipley.
Prof. Sollas.*
Dr. Stapf.
Mrs. Stebbing.
Rev. T. R. R. Stebbing.
Mr. J. Steel.*
Dr. J. J. H. Teall.*
Mrs. Teall.*
Miss E. N. Thomas.*
Mr. Vallentin.
Mrs. Vallentin.*
Dr. T. H. Warren.*
Prof. Weiss.
Dr. A. Smith Woodward.
Mrs. A. Smith Woodward.*

An asterisk is appended to each guest, official or private.

Prof. I. B. Balfour,
Dr. G. H. Fowler,
Mr. Nicholson jr., and
Mr. A. W. Sutton,
who had accepted invitations, were prevented from being present.

Programme

OF THE

PROCEEDINGS AT THE RECEPTION

by the PRESIDENT and COUNCIL

IN THE

ROOMS OF THE SOCIETY

at BURLINGTON HOUSE, PICCADILLY,

on WEDNESDAY, 1st JULY, 1908,

at 9.0 p.m.

The PRESIDENT and Mrs. SCOTT received the Guests in the Library on the First Floor.

Objects exhibited in the Library.

Addresses from Universities, Academies, Societies and other corporate bodies, presented at the Afternoon Meeting.

Portrait of Darwin from a photograph by his son, from which the Darwin-medal portrait was principally modelled. Recent photographs of Dr. A. R. Wallace, and an older one on which the medal-portrait was based.

Plaster casts from the dies of the medal, by Mr. F. Bowcher.

EAST TABLE.

Flowers of natural hybrid Odontoglossums with their parents; some of these hybrids have been proved experimentally.

Exhibited (by permission of the Director, Royal Botanic Gardens Kew) by R. Allen Rolfe, A.L.S.

1. *Odontoglossum crispum*, Lindl., from Pacho, showing wide range of variation, with numerous blotched varieties (so-called) from the Pacho and Velez districts.

2. *Odontoglossum crispum* var. *Lehmanni*, from Popayan, showing small range of variation.

3. Species with which *O. crispum* grows intermixed in the Pacho and Velez districts.

 O. gloriosum, Linden & Reichb. f., in Pacho and Velez districts.
 O. Lindleyanum, Reichb. f. & Warsc., in Pacho and Velez districts.
 O. luteopurpureum, Lindl., in Pacho district.
 O. Hunnewellianum, Rolfe, in Velez district (only).
 O. triumphans, Reichb. f., in Velez district.

4. Natural hybrids between *O. crispum* and other species which grow with it.

O. Andersonianum (*crispum* × *gloriosum*).
O. Coradinei * (*crispum* × *Lindleyanum*).
O. Wilckeanum * (*crispum* × *luteopurpureum*).
O. Adrianæ * (*crispum* × *Hunnewellianum*).
O. harvengtense * (*crispum* × *triumphans*).

* The asterisk indicates that these four have also been raised artificially in gardens.

5. Other hybrids from the same district.

O. Mulus (*gloriosum* × *luteopurpureum*).
O. acuminatissimum (*Lindleyanum* × *luteopurpureum*).
O. prævisum (*gloriosum* × *Lindleyanum*).
O. Hudsoni (*gloriosum* × *Hunnewellianum*).

6. Artificial hybrids of *O. crispum* with species which grow in different regions.

O. armainvillierense (*O. crispum* × *nobile*).
O. crispo-Harryanum (*O. crispum* × *Harryanum*).
O. Lambeauianum (*O. crispum* × *Rolfeæ*).
O. Thompsonianum (*O. crispum* × *Edwardii*).
Odontioda Bradshawiana (*O. crispum* × *Cochlioda Noetzliana*).

7. Living plants and flowers of the species :—

O. crispum. Pacho and Velez.
O. Lindleyanum. Pacho and Velez.
O. luteopurpureum. Pacho.
O. Hunnewellianum. Velez.
O. triumphans. Velez and Ocaña.
O. nobile, Reichb. f. Ocaña.

with the hybrids :—

O. harvengtense (*loochristiense*) ; *O. Wilckeanum* ; *O. Adrianæ* ; *O. armainvillierense.*

Mr. R. Allen Rolfe, A.L.S., has since supplied the following statement :—

Odontoglossum crispum is a very popular garden Orchid which has been cultivated for upwards of forty years, and during the latter part of that time has been imported in enormous quantities. It is a

native of Colombia, and grows in at least three distinct districts, at an altitude of about 7,500 to 8,800 feet, and in a fairly temperate climate. It grows more or less in company with several other species, with some of which it hybridises.

For many years it was imported from what is known as the Pacho district, on the Eastern Cordillera, in which it was originally discovered, by Hartweg, and with it three other species and a number of curious intermediate forms, some of which have been regarded as varieties of it and others as natural hybrids. The three other species mentioned are *O. gloriosum*, *O. luteopurpureum*, and *O. Lindleyanum*, with all of which it hybridises; and it is an interesting fact that all the six possible combinations between the four species known to grow together have now been recognised They may be enumerated as follows:—

O. crispum × *O. gloriosum* = *O. Andersonianum.*
O. crispum × *O. luteopurpureum* = *O. Wilckeanum.*
O. crispum × *O. Lindleyanum* = *O. Coradinei.*
O. gloriosum × *O. luteopurpureum* = *O. Mulus.*
O. luteopurpureum × *O. Lindleyanum* = *O. acuminatissimum.*
O. gloriosum × *O. Lindleyanum* = *O. prævisum.*

The first four of these hybrids are remarkably variable, and certain forms which have been referred to them are difficult to separate from others which are referred to *O. crispum*, which is also very variable in this district. So numerous are these intermediate forms, and so perplexing their affinities, that the species have been spoken of as "confluent in series." It is now clear that this is due to the further intercrossing of the hybrids with the parent species, as is explained later.

A second district for *Odontoglossum crispum* was discovered by the late Consul Lehmann, on the Central Cordillera, near Popayan, some 200 miles distant from the original locality, where it occurs in a quite distinct form, which was described by Reichenbach as *O. crispum* var. *Lehmanni*. The flowers are smaller, with narrower segments, and the inflorescence branched. Here the species shows little variation, and no natural hybrids are certainly known to occur, while it is significant that there is a complete absence of those richly blotched and spotted forms which are found in the Pacho district, and which are so highly prized by

connoisseurs. In fact the form found in this district is not popular in cultivation.

Still later *O. crispum* was found in another district, on the Eastern Cordillera, about 100 miles north of Pacho, known as the Velez district, which is separated from the Pacho district by an intervening area in which the altitude and climate are totally unsuitable for *O. crispum*. In this Velez district two additional species occur in company with *O. crispum*, namely, *O. Hunnewellianum*, abundantly, and *O. triumphans*, in a somewhat limited area, while *O. luteo-purpureum* is believed to be absent from the greater part of the district. Here we get two additional natural hybrids, namely:—

O. crispum × *O. Hunnewellianum* = *O. Adrianæ*.
O. crispum × *O. triumphans* = *O. harvengtense* (*loochristiense*).

The first-named is common and remarkably variable, and its presence in an importation of *O. crispum* affords an infallible clue to the locality. Both have been raised artificially, so that there is not a shadow of doubt about their origin. Here also *O. crispum* is extremely variable, and there is a type of variation which is not found in the Pacho district, namely that approaching the natural hybrid *O. Adrianæ*, the cause of which is now apparent. The secondary hybrid from *O. crispum* and *O. Adrianæ* has been raised artificially, and is again fairly intermediate between them, while it can also be matched among wild plants which have been referred to *O. crispum*. This secondary hybrid is known under the name of *Odontoglossum Fascinator*, and the fact that it exists as a wild plant is significant. *O. crispum* has also been intercrossed with its hybrid *O. Andersonianum*, resulting in *O. Stewartianum*, and with *O. Coradinei*, yielding *O. Crispodinei*, both secondary hybrids which can be fairly matched among wild plants.

These facts afford a clue to the origin of the so-called "blotched crispums." It is seen that it is where *O. crispum* grows in company with other normally blotched species that these so-called "blotched crispums" occur, and that they are absent from localities where the species grows by itself; also that similarly blotched forms can be raised artificially by crossing *O. crispum* with its own hybrids, and the inference naturally follows that the said forms are not simple varieties of *O. crispum*, but natural hybrids of mixed parentage, which owe their origin to insect agency, where the parent species

happen to grow intermixed. Approximately parallel cases are now known among artificial hybrids of *O. crispum* with species which grow in different localities, particularly with *O. Harryanum*. All these hybrids are completely fertile.

Thus we have evidence that *O. crispum* grows naturally with five other species, with all of which it hybridises, and that the resulting primary hybrids again cross with the original species, yielding secondary hybrids, some of which are not distinguishable from what have usually been considered as spotted forms of *O. crispum*. All this has long been suspected, and now the details are being filled in by cultural experiments. It is believed that the process extends much further, for the agencies by which these puzzling intermediate forms have arisen have been in existence for ages. For a long time their origin was a matter of inference, after comparison with the original species; but recent experiments, while confirming these inferences, have carried the matter further, and revealed a new complication, in the existence of what is known as "reversion."

In the case of secondary hybrids, at least, seedlings out of the same capsule often show a remarkable polymorphism, and some of them so closely resemble the original species that in the absence of a knowledge of their origin they would be referred to them. A single example may be mentioned. Some time ago M. Peeters, of Brussels, crossed the natural hybrid *O. Adrianæ* with a blotched form of *O. crispum*, and from the resulting capsule raised a large batch of seedlings, which have now flowered. During a recent visit to Brussels I had the good fortune to see them, and I was astonished at the range of variation, which seemed almost incredible. There were forms with white, light yellow, and deep yellow ground-colour, with the greatest possible amount of variation in the size of the flowers, and in the size, number, arrangement, and colour of the spots. Without a knowledge of their origin some would have been referred to *O. Adrianæ* and others to spotted forms of *O. crispum*, and yet all are technically forms of *O. Fascinator*, which had previously been raised.

Hybrid Odontoglossums are not by any means confined to the regions just mentioned. *O. triumphans* and *O. gloriosum* extend into the Ocaña district, where they cross, giving *O. Leeanum*, and here the former with *O. nobile* yields *O. excellens* (whose parentage has been proved), and the latter with *O. nobile* produces *O. lepidum*,

which has several synonyms. *O. triumphans* also grows with *O. blandum*, the two producing *O. Cookeanum*; and *O. Lindleyanum* extends into the Yaramal district, and crossing with *O. Harryanum* yields *O. Wattianum* (whose parentage has also been proved experimentally). Other hybrids occur in the Ocaña district, some in Ecuador, and some in Mexico. Our knowledge of them depends largely upon the popularity of the species as garden plants, and the frequency with which they are imported, for they almost invariably appear accidentally among importations of the parent species, and their presence is not detected until they flower. Our knowledge of *O. crispum* is almost entirely due to its popularity as a garden plant, and to the enormous quantities in which it has been imported, and to the same popularity is due the successful efforts to raise it and the allied forms from hybrid seed. Without such popularity our knowledge of the facts adduced would have been practically nil.

These facts, it is believed, could be paralleled in the genera *Salix*, *Rosa*, *Rubus*, and various others, if their history could be investigated in the same way. Again, it may be remarked that natural hybrids are known in many other Orchid genera, and are common in a few, and in some cases they have been described as species, in others as varieties of one of the parents. The facts are well known in a large number of cases, and in a few the parentage has been proved experimentally. The subject is worthy of increased attention, for crossing increases variability, and variation is the material on which natural selection works. Many hybrids are completely fertile, and spontaneous hybrids often possess such distinctive features as to have been described as new species or as varieties of one or the other parent. Their permanence is a matter for further study and experiment. Crossing may lead to or hasten the appearance of distinct races, for there are many races of "florist's flowers" and other garden plants which are known to be of mixed origin. Thus hybridisation is a question of great biological importance, and one to be taken into consideration in discussing the very origin of species, indeed it is probably of more importance than has yet been realised.

CENTRE TABLE.

Problems of Evolution illustrated by Insects from the Hope Collections in the Oxford University Museum.

i. Mimicry in New World *Papilionidæ*.

Exhibited by the Hope Professor of Zoology and Mr. J. C. Moulton.

The existence of superficial resemblances between the American Papilios was pointed out by H. W. Bates in 1860 (Trans. Ent. Soc. Ser. II. vol. v. p. 335), and by A. R. Wallace in 1864 (Trans. Linn. Soc., vol. xxv. p. 10).

These interesting examples of mimicry could, however, only be adequately appreciated when the classification of the sub-family *Papilionidæ* had been put on a solid foundation by E. Haase (Bibliotheca Zoologica, Stuttgart, Bd. iii. Heft 8, 1891–3) following the lines suggested by Horsfield in 1857 (Cat. Lep. Ins. Mus. E. I. Comp.). A full and detailed treatment of the subject has now been rendered possible as a result of Rothschild and Jordan's masterly revision (Nov. Zool. xiii. 1906, p. 411).

ii.

A. The Transition between species of Butterflies usually considered to be distinct.

(1) Three forms of the genus *Catopsilia*, viz., *C. crocale* Cram., *C. pomona* Fabr., and *C. catilla* Cram., were originally described as distinct species, and are still usually so considered. The exhibit shows that a perfect gradation exists between the typical forms of *C. crocale* on the one hand and of *C. catilla* on the other, *C. pomona* occupying an intermediate position between the two.

(2) A similar transitional series connects two species of *Mylothris*, always hitherto treated as distinct, viz., *M. chloris* Fabr. and *M. agathina* Cram.

B. Sexual Dimorphism in Butterflies, associated with special protection for the Female.

Attention has been drawn by Dr. A. R. Wallace to the fact that in cases where the sexes differ in aspect, the female is usually the

better protected of the two. This protection against insect-eating enemies may be effected (1) by a general dulness or darkness of coloration, tending to concealment; or (2) by a cryptic resemblance to some inanimate object, such as a dead leaf; or, finally, (3) by mimicry of some distasteful insect, often belonging to a widely different group.

Examples of all these methods are shown, and the fact is illustrated that the males may in some cases take no share in the means of defence adopted by the females, while in other cases they enjoy a similar provision against attack, but in a lower degree.

Exhibited by Dr. F. A. Dixey.

iii. A series of *Melanitis leda*, Linn., taken at Curepipe, Mauritius, March to December, 1905, arranged in the order of capture. The variability of the *Underside* of the Butterfly is shown as well as the effect of season: in the wet season ocelli are usually more marked, in the dry season the underside is usually more leaf-like.

Exhibited by Col. N. Manders, R.A.M.C.

iv. Scents in Butterflies.

(*a*) Agreeable scents, presumably attractive, usually confined to the male.

(*b*) Disagreeable scents, presumably repulsive, usually common to both sexes, but often more pronounced in the female. This group includes many species known to be distasteful to insectivorous animals.

[*The flowers, or other objects, to which the scents have been compared were indicated in red.*]

Exhibited by Dr. Dixey and Dr. G. B. Longstaff.

v. The apparent "two heads" of the *Lycænidæ*.

Many Blues and Hairstreaks rest with the head downwards, but the peculiar structure and marking of the hind-wings give the appearance of a head with antennæ at the tail end of the Butterfly. This doubtless often deceives their enemies, accordingly many Lycænids are captured which bear evidence of having escaped with their lives by the loss of their "false-heads."

vi. Butterflies concealed when at rest by their surroundings or their attitudes.

(*a*) Conspicuous white or yellow Butterflies seeking yellow leaves to rest upon.

(*b*) The general effect of common natural backgrounds in more or less aiding concealment.

(*c*) Special rest attitudes aiding concealment.

vii. Special adaptations in *Tettigides* (a group of Grasshoppers).

(*a*) The pronotum developed into a leaf-like appendage greatly aiding the concealment of the insect.

(*b*) The hind-tibia and tarsus modified to make an oar for swimming under water.

viii. Indian species of *Conopidæ* (Flies) closely imitating *Eumenidæ* and *Vespidæ* (Wasps) on which their larvæ are probably parasitic. The specimens were taken together about nearly dried-up springs at Matheran, Western Ghâts.

ix. An insular fauna compared with that of the mainland.

Many Jamaican butterflies differ slightly in colour from their nearest South American representatives; they are usually brighter in tint, with more fulvous and less black.

Exhibited by Dr. G. B. Longstaff.

WEST TABLE.

CASE 1. Personal relics and a selection of manuscripts in the handwriting of Carl von Linné. Amongst them are his Lapland Journal, his Autobiography, an early sketch of the flora of his native place, a walking-stick, etc.

CASE 2. Contains the commission to CARL VON LINNÉ to explore Lapland, and the various passports issued to him on his journey. The other side of the case has part of the manuscript of the 'Supplementum plantarum,' the state of which shows its growth by interpolation.

CASE 3. Contains the Recommendation Certificates of CHARLES ROBERT DARWIN, of his grandfather Dr. ERASMUS DARWIN, and of Dr. ALFRED RUSSEL WALLACE.

(*Certificate in the handwriting of Dr. J. E. SMITH, P.L.S.*)

ERASMUS DARWIN, M.D., F.R.S., of Derby, author of a poem entitled The Botanic Garden and of several other works, being desirous of becoming a Fellow of the Linnean Society, we the underwritten believing him highly worthy of that honour, recommend him to be elected accordingly.

July 17 : 1792.

J. DRYANDER.
SAM^{L} GOODENOUGH.

(*Written Certificate.*)

CHARLES DARWIN, Esquire, M.A., F.R.S., G.S., etc. etc., of Down, Farnborough, Kent, a gentleman much attached to the study of Natural History, being desirous of becoming a Fellow of the Linnean Society, we the undersigned, do of our personal knowledge recommend him, as deserving that honour, and likely to prove a useful and valuable member.

THOMAS BELL, *Pres.*
SYLVANUS HANLEY.
JOS. D. HOOKER.
EDWARD FORBES.
ROBERT BROWN.
J. S. HENSLOW.
JOHN J. BENNETT.
ADAM WHITE.

Proposed, Dec. 20th, 1853.
Ballot, March 7th, 1854.
Elected, J. J. B.

(*On the Printed Form of Recommendation.*)

Alfred Russell (*sic*) Wallace, Esq., of Holly House, Barking, Essex,

a gentleman attached to the study of Natural History, especially

Entomology, and well known for his travels and researches in Natural History in South America and in the Eastern Archipelago,

being desirous of becoming a Fellow of the Linnean Society of London, we whose names are underwritten, beg leave to recommend him to that Honour.

George Bentham.
H. T. Stainton.
Jos. D. Hooker.
Alfred W. Bennett.
Samuel Stevens.
Albert Miller.
W. H. Holdsworth.
Alfred Newton.
W. H. Flower.
J. W. Dunning.
G. R. Gray.
Edward Sheppard.

This Certificate was read at a General Meeting of the Society on the 2nd day of November, 1871.
The Ballot will take place on the 18th day of January, 1872.
Elected, R^d. K.

In the **MEETING ROOM**, on the ground floor, two short Lantern Demonstrations were given during the evening.

At 9.30. Prof. A. C. Seward, F.R.S., F.L.S.

"THE JURASSIC VEGETATION OF THE WORLD: A STUDY IN PLANT-MIGRATION."

The Lecturer dealt with the geographical distribution of Jurassic plants, calling special attention to the general uniformity in the floras which occur in almost all parts of the world.

He emphasised the importance of bearing in mind the opinions expressed by Darwin and by Hooker in regard to the Imperfection of the Geological Record and quoted Huxley's words on the impossibility of demonstrating absolute synchronism of strata.

A brief account was given of the Jurassic vegetation as represented by specimens obtained from the Inferior Oolite rocks of the Yorkshire coast, attention being called to the apparent absence of Flowering plants. The wide distribution of floras classed as Jurassic was illustrated by maps and by drawings of specimens collected in widely separated regions. *Araucarites*, some genera of Cycads, the Maidenhair tree, *Matonidium*, *Cladophlebis*, and other Jurassic types were described. Special attention was called to the important discovery made a few years ago by Prof. Andersson, of the Swedish Antarctic expedition, of Jurassic plants in Louis Philippe Land (lat. 63° 15′ S.): through the kindness of Prof. Nathorst and Prof. Andersson the Lecturer was able to show some illustrations, not yet published, of these Antarctic plants which are now being described by Prof. Nathorst.

In conclusion reference was made to the question of means of dispersal possessed by members of the Jurassic Floras.

At 10.15. Dr. A. Smith Woodward, F.R.S., V.P.L.S.

"THE EVOLUTION OF MAMMALS IN SOUTH AMERICA."

The subject of the Evolution of South American Mammals is appropriate on the present occasion, because Darwin was one of the pioneers in the discovery of fossil mammalian remains in the Argentine pampas. During the 'Beagle' expedition he found the first evidence of the extinct ground-sloths, *Mylodon* and *Scelidotherium*, and of the strange large hoofed-animal *Toxodon*. Since Darwin's time, our knowledge of these great quadrupeds and their contemporaries has been remarkably extended; and within the last 20 years their ancestry has been partially revealed by discoveries in older Tertiary formations to the south in Patagonia. The problem of the evolution of South American mammal-life has thus become understood, and can now be clearly stated. Like all other achievements in the study of fossils, it still remains a problem; but there is at least some satisfaction in having discovered the general nature of the phenomena which have to be explained.

According to our present knowledge, it appears that all the modern groups of mammals have come into existence since the Cretaceous period, namely, during Tertiary times. There is good reason to believe that at the end of the Cretaceous period small mammals of essentially the same kind were distributed over all the large land-areas. These mammals were carnivorous or mixed-feeders, with a comparatively small brain; and in every respect they may well have been the direct ancestors of all the mammals of later times. Portions of jaws and a few limb-bones of such mammals have been found to the north of Patagonia, showing that they lived in South America as elsewhere. It is thus evident that the mammal-life of South America began its career in the same way as that of the more extensive continents in the northern hemisphere. As proved by the geology of the Panama region, however, it so happened that South America was completely separated from the northern lands during the earlier half of the Tertiary period, when the main part of the evolution of the mammals occurred. Their development on this southern land was therefore independent of that on other continents; and the result was the production of several groups peculiar to South America, some of them remarkable mimics of groups that occur elsewhere. Most of these mammals became extinct when a

land-connection with North America permitted the immigration of dogs, large cats, bears, llamas, deer, peccaries, tapirs, horses, mastodons, and other northern mammals—for none of these originated in South America. Only the sloths, armadillos, anteaters, rodents, monkeys, and certain small marsupials withstood the invasion and survived until the present day.

The land-area of the South American region when the early Tertiary mammals arose, may perhaps have been more extensive than it is now. It may even have formed part of a great Antarctic continent, which included also Australia. The discovery of the large extinct horned tortoise, *Miolania*, both in Queensland and in Patagonia, is supposed to favour this hypothesis; and there are other discoveries which admit of interpretation in the same way.

The Edentata are clearly shown by fossils to have originated in South America, and they can be traced upwards from small ancestors to the gigantic ground-sloths and armadillos, which seem to have become extinct just before European man reached the continent. They wandered into the warm regions of North America as soon as the land-bridge of Panama was established, but they are probably not connected in any way with the so-called Edentata of the Old World. Strange Ungulates (Toxodontia, Typotheria, and Litopterna), which in some respects resemble Rodents, can also be traced through the rocks from small beginnings to gigantic representatives (e. g. *Toxodon* and *Macrauchenia*) which lived just before the race died out. Some of the Litopterna were one-toed, and were curious mimics of the horses of the northern hemisphere. Rodents were always numerous, and some of them became as large as cattle when the great ground-sloths flourished. Most interesting are the associated Carnivores, whose skeletons are so closely similar to those of the existing Thylacines of Tasmania, that they are often regarded as true Marsupials genetically connected with the Australasian forms. These animals became extinct when the dogs, cats, and bears invaded South America from the north. Monkeys seem to have originated early and changed little with the lapse of time.

During recent years the most active students of the extinct South American mammals have been Dr. Florentino Ameghino of Buenos Aires, Prof. W. B. Scott and his colleagues in Princeton (U.S.A.), and the veteran Prof. Albert Gaudry of Paris. Their writings may be consulted for an exact account of our present knowledge of the subject.

MINUTES

OF THE

SPECIAL GENERAL MEETING

HELD ON

THURSDAY, 1ST JULY, 1858.

SPECIAL MEETING.

July 1st, 1858.

Present,—

Thomas Bell, Esq., President, in the Chair.

Sir Charles Lyell.	Mr. Syme.
Dr. Hooker.	Mr. Currey.
Mr. Bentham.	Dr. Baird.
Mr. Ward.	Dr. Fitton.
Mr. Camplin.	Mr. Stevens.
Mr. Heward.	Dr. Carpenter.
Mr. Dyster.	Dr. Seemann.
Mr. Oliver.	Mr. Henfrey.
Mr. Pratt.	Mr. W. Hawkins.
Mr. Salter.	Dr. Burchell.
Dr. Macdonald.	Mr. Buckton.
Mr. Archer.	Mr. W. Buckton.
Mr. Ball.	Mr. Black, Assoc.
[Dr. C. Collingwood.]	

etc. etc.

Visitors.	*Introduced by*
Dr. Baly.	Mr. Dyster.
Dr. Melville.	Mr. Ward.

The minutes of the last meeting were read.

The following donations were received and thanks were ordered for them, viz. :—

Mémoires de la Société Roye des Sciences de Liège, tomes 11e et 13e. Presented by the Society.

Proceedings of the Royal Society, vol. 9, No. 31. Presented by the Society.

Journal of the Society of Arts, Nos. 291–2. Presented by the Society.

Abstracts of the Proceedings of the Geological Society, No. 18. Presented by the Society.

Nos. 103–4 (4th series) of the Philosophical Magazine and No. 7 (3rd series) of the Annals of Natural History. Both presented by Richard Taylor, Esq., F.L.S.

Nos. 2161–2 of the Literary Gazette. Presented by Lovell Reeve, Esq., F.L.S.

Original Drawings of Tasmanian Orchideæ, by William Archer, Esq., F.L.S. Presented by Mr. Archer.

Handbook of the British Flora, by George Bentham, Esq., F.L.S. Presented by the Author.

Part 9 of the Grasses of Great Britain. Presented by J. E. Sowerby, Esq.

Examination of Pavon's collection of Peruvian Barks contained in the British Museum. Presented by the Author, J. E. Howard, Esq., F.L.S.

Flora Melitensis. Presented by the Author, Dr. J. C. Grech Delicata.

Specimens of Highgate Resin. Presented by J. W. Wetherall, Esq.

The meeting having been specially summoned for the election of a Member of Council in place of Robert Brown, Esq., V.P., deceased, the President opened the business of the day, and the members present proceeded to ballot.

The Ballot having closed, the President appointed Dr. Seemann, Mr. Archer, and Mr. Heward to be Scrutineers, to examine the Lists and report the result; and the Votes having been counted, and reported to the President, he declared George Bentham, Esq., to be elected a Member of Council for the ensuing year.

The President nominated George Bentham, Esq., to be a Vice-President in the place of Robert Brown, Esq., for the ensuing year.

It was moved by Sir Charles Lyell, seconded by Mr. Bennett, and carried unanimously:

> "That this Meeting desires most emphatically to record its deep sense of the eminent services rendered

by the late Robert Brown, Esq., both to the Linnean Society and to Botanical Science, by the entire devotion of a long life and of talents of the highest order to the promotion of the great objects for which the Society was formed.

"That it looks back with heartfelt satisfaction to the long period of sixty years, during which Mr. Brown was connected with the Society, as an Associate, as Librarian, as a Fellow, as a Vice-President, and as President, and is profoundly sensible of the honour which the Society has derived from this long and intimate connexion with so great a Master in Botanical Science.

"That while thus recording its high appreciation of the eminent talents of this great man, and of their successful application to the pursuit of Natural Science, this Meeting cannot refrain from also paying a just tribute to the simple-hearted benevolence of disposition, the high moral purity of mind, and the unswerving rectitude of judgment, which formed the most striking distinctions of his individual character.

"That influenced by these various considerations, this Meeting deeply deplores the loss which the Linnean Society and Natural Science have sustained by the death of so distinguished, and at the same time, so estimable, a man."

Read 1st, a letter from Sir Charles Lyell, F.L.S., and Dr. Hooker, F.L.S., addressed to the Secretary, as introductory to the following Papers, on the laws which affect the production of varieties, races, and species, viz. :

An abstract from a MS. work on species, by Charles Darwin, Esq., F.R.S. & L.S., sketched in 1839 and copied in 1844.

An abstract of a letter addressed by Mr. Darwin to Prof. Asa Gray of Boston, U.S., in Oct. 1857.

An essay on the tendency of varieties to depart indefinitely from the original type ; by A. R. Wallace, Esq.

Read 2ndly: "Notes on the organization of *Pharonis Hippocrepis*" by F. D. Dyster, M.D., F.L.S.

3rdly: "Observations on *Ammocœtus*" by Saml. Highley, Esq., communicated by Professor Bell, Pres. L.S.

4thly: "On *Hanburia*, a new genus of Cucurbitaceæ," by Berthold Seemann, Esq., M.D., F.L.S.

5thly: A MS. Memoir, by the late Prof. Pavon, entitled "Nueva Quinologia," with observations by J. E. Howard, Esq., F.L.S.

6thly: Two letters on "the Vegetation of Angola" by Dr. F. Welwitsch; addressed to W. W. Saunders, Esq., V.P.L.S.

(Signed) Thomas Bell.
(*President.*)

REPRINT

OF THE PAPERS BY

CHARLES DARWIN and ALFRED RUSSEL WALLACE

READ ON THE 1st JULY, 1858.

From the Journal of the Society, Zoology, Vol. III. No. 9,
published 20th August, 1858. Pp. 45-62.

On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection.

By Charles Darwin, Esq., F.R.S., F.L.S., & F.G.S., and Alfred Wallace, Esq. Communicated by Sir Charles Lyell, F.R.S., F.L.S., and J. D. Hooker, Esq., M.D., V.P.R.S., F.L.S., &c.

[Read July 1st, 1858.]

London, June 30th, 1858.

My Dear Sir,—The accompanying papers, which we have the honour of communicating to the Linnean Society, and which all relate to the same subject, viz. the Laws which affect the Production of Varieties, Races, and Species, contain the results of the investigations of two indefatigable naturalists, Mr. Charles Darwin and Mr. Alfred Wallace.

These gentlemen having, independently and unknown to one another, conceived the same very ingenious theory to account for the appearance and perpetuation of varieties and of specific forms on our planet, may both fairly claim the merit of being original thinkers in this important line of inquiry; but neither of them having published his views, though Mr. Darwin has for many years past been repeatedly urged by us to do so, and both authors having now unreservedly placed their papers in our hands, we think it would best promote the interests of science that a selection from them should be laid before the Linnean Society.

Taken in the order of their dates, they consist of:—

1. Extracts from a MS. work on Species *, by Mr. Darwin, which was sketched in 1839, and copied in 1844, when the copy was read by Dr. Hooker, and its contents afterwards communicated to Sir Charles Lyell. The first Part is devoted

* This MS. work was never intended for publication, and therefore was not written with care.—C. D. 1858.

to "The Variation of Organic Beings under Domestication and in their Natural State;" and the second chapter of that Part, from which we propose to read to the Society the extracts referred to, is headed, "On the Variation of Organic Beings in a state of Nature; on the Natural Means of Selection; on the Comparison of Domestic Races and true Species."

2. An abstract of a private letter addressed to Professor Asa Gray, of Boston, U.S., in October 1857, by Mr. Darwin, in which he repeats his views, and which shows that these remained unaltered from 1839 to 1857.

3. An Essay by Mr. Wallace, entitled "On the Tendency of Varieties to depart indefinitely from the Original Type." This was written at Ternate in February 1858, for the perusal of his friend and correspondent Mr. Darwin, and sent to him with the expressed wish that it should be forwarded to Sir Charles Lyell, if Mr. Darwin thought it sufficiently novel and interesting. So highly did Mr. Darwin appreciate the value of the views therein set forth, that he proposed, in a letter to Sir Charles Lyell, to obtain Mr. Wallace's consent to allow the Essay to be published as soon as possible. Of this step we highly approved, provided Mr. Darwin did not withhold from the public, as he was strongly inclined to do (in favour of Mr. Wallace), the memoir which he had himself written on the same subject, and which, as before stated, one of us had perused in 1844, and the contents of which we had both of us been privy to for many years. On representing this to Mr. Darwin, he gave us permission to make what use we thought proper of his memoir, &c.; and in adopting our present course, of presenting it to the Linnean Society, we have explained to him that we are not solely considering the relative claims to priority of himself and his friend, but the interests of science generally; for we feel it to be desirable that views founded on a wide deduction from facts, and matured by years of reflection, should constitute at once a goal from which others may start, and that, while the scientific world is waiting for

the appearance of Mr. Darwin's complete work, some of the leading results of his labours, as well as those of his able correspondent, should together be laid before the public.

We have the honour to be yours very obediently,

CHARLES LYELL.
JOS. D. HOOKER.

J. J. Bennett, Esq.,
Secretary of the Linnean Society.

I. *Extract from an unpublished Work on Species, by* C. DARWIN, Esq., *consisting of a portion of a Chapter entitled, "On the Variation of Organic Beings in a state of Nature; on the Natural Means of Selection; on the Comparison of Domestic Races and true Species."*

De Candolle, in an eloquent passage, has declared that all nature is at war, one organism with another, or with external nature. Seeing the contented face of nature, this may at first well be doubted: but reflection will inevitably prove it to be true. The war, however, is not constant, but recurrent in a slight degree at short periods, and more severely at occasional more distant periods; and hence its effects are easily overlooked. It is the doctrine of Malthus applied in most cases with tenfold force. As in every climate there are seasons, for each of its inhabitants, of greater and less abundance, so all annually breed; and the moral restraint which in some small degree checks the increase of mankind is entirely lost. Even slow-breeding mankind has doubled in twenty-five years; and if he could increase his food with greater ease, he would double in less time. But for animals without artificial means, the amount of food for each species must, *on an average*, be constant, whereas the increase of all organisms tends to be geometrical, and in a vast majority of cases at an enormous ratio. Suppose in a certain spot there are eight pairs of birds, and that *only* four pairs of them annually (including double hatches) rear only four young, and that these go on rearing their young at the same rate,

then at the end of seven years (a short life, excluding violent deaths, for any bird) there will be 2048 birds, instead of the original sixteen. As this increase is quite impossible, we must conclude either that birds do not rear nearly half their young, or that the average life of a bird is, from accident, not nearly seven years. Both checks probably concur. The same kind of calculation applied to all plants and animals affords results more or less striking, but in very few instances more striking than in man.

Many practical illustrations of this rapid tendency to increase are on record, among which, during peculiar seasons, are the extraordinary numbers of certain animals; for instance, during the years 1826 to 1828, in La Plata, when from drought some millions of cattle perished, the whole country actually *swarmed* with mice. Now I think it cannot be doubted that during the breeding-season all the mice (with the exception of a few males or females in excess) ordinarily pair, and therefore that this astounding increase during three years must be attributed to a greater number than usual surviving the first year, and then breeding, and so on till the third year, when their numbers were brought down to their usual limits on the return of wet weather. Where man has introduced plants and animals into a new and favourable country, there are many accounts in how surprisingly few years the whole country has become stocked with them. This increase would necessarily stop as soon as the country was fully stocked; and yet we have every reason to believe, from what is known of wild animals, that *all* would pair in the spring. In the majority of cases it is most difficult to imagine where the checks fall—though generally, no doubt, on the seeds, eggs, and young; but when we remember how impossible, even in mankind (so much better known than any other animal), it is to infer from repeated casual observations what the average duration of life is, or to discover the different percentage of deaths to births in different countries, we ought to feel no surprise at our being unable to discover where the check falls in any animal or plant. It should always be remembered, that in most cases the checks are recurrent yearly in a small, regular degree, and in an extreme degree during unusually cold, hot, dry, or wet years, according to the constitution of the being in question. Lighten any check in the least degree, and the geometrical powers of increase in every organism will almost instantly increase the average number of the favoured species. Nature may be compared to a surface on which rest ten thousand sharp

wedges touching each other and driven inwards by incessant blows. Fully to realize these views much reflection is requisite. Malthus on man should be studied ; and all such cases as those of the mice in La Plata, of the cattle and horses when first turned out in South America, of the birds by our calculation, &c., should be well considered. Reflect on the enormous multiplying power *inherent and annually in action* in all animals ; reflect on the countless seeds scattered by a hundred ingenious contrivances, year after year, over the whole face of the land ; and yet we have every reason to suppose that the average percentage of each of the inhabitants of a country usually remains constant. Finally, let it be borne in mind that this average number of individuals (the external conditions remaining the same) in each country is kept up by recurrent struggles against other species or against external nature (as on the borders of the Arctic regions, where the cold checks life), and that ordinarily each individual of every species holds its place, either by its own struggle and capacity of acquiring nourishment in some period of its life, from the egg upwards ; or by the struggle of its parents (in short-lived organisms, when the main check occurs at longer intervals) with other individuals of the *same* or *different* species.

But let the external conditions of a country alter. If in a small degree, the relative proportions of the inhabitants will in most cases simply be slightly changed ; but let the number of inhabitants be small, as on an island, and free access to it from other countries be circumscribed, and let the change of conditions continue progressing (forming new stations), in such a case the original inhabitants must cease to be as perfectly adapted to the changed conditions as they were originally. It has been shown in a former part of this work, that such changes of external conditions would, from their acting on the reproductive system, probably cause the organization of those beings which were most affected to become, as under domestication, plastic. Now, can it be doubted, from the struggle each individual has to obtain subsistence, that any minute variation in structure, habits, or instincts, adapting that individual better to the new conditions, would tell upon its vigour and health ? In the struggle it would have a better *chance* of surviving ; and those of its off-spring which inherited the variation, be it ever so slight, would also have a better *chance*. Yearly more are bred than can survive ; the smallest grain in the balance, in the long run, must tell on which death shall fall, and which shall survive. Let this work of

selection on the one hand, and death on the other, go on for a thousand generations, who will pretend to affirm that it would produce no effect, when we remember what, in a few years, Bakewell effected in cattle, and Western in sheep, by this identical principle of selection?

To give an imaginary example from changes in progress on an island:—let the organization of a canine animal which preyed chiefly on rabbits, but sometimes on hares, become slightly plastic; let these same changes cause the number of rabbits very slowly to decrease, and the number of hares to increase; the effect of this would be that the fox or dog would be driven to try to catch more hares: his organization, however, being slightly plastic, those individuals with the lightest forms, longest limbs, and best eyesight, let the difference be ever so small, would be slightly favoured, and would tend to live longer, and to survive during that time of the year when food was scarcest; they would also rear more young, which would tend to inherit these slight peculiarities. The less fleet ones would be rigidly destroyed. I can see no more reason to doubt that these causes in a thousand generations would produce a marked effect, and adapt the form of the fox or dog to the catching of hares instead of rabbits, than that greyhounds can be improved by selection and careful breeding. So would it be with plants under similar circumstances. If the number of individuals of a species with plumed seeds could be increased by greater powers of dissemination within its own area (that is, if the check to increase fell chiefly on the seeds), those seeds which were provided with ever so little more down, would in the long run be most disseminated; hence a greater number of seeds thus formed would germinate, and would tend to produce plants inheriting the slightly better-adapted down*.

Besides this natural means of selection, by which those individuals are preserved, whether in their egg, or larval, or mature state, which are best adapted to the place they fill in nature, there is a second agency at work in most unisexual animals, tending to produce the same effect, namely, the struggle of the males for the females. These struggles are generally decided by the law of battle, but in the case of birds, apparently, by the charms of their song, by their beauty or their power of courtship, as in the dancing rock-thrush of Guiana. The most vigorous and healthy males, implying

* I can see no more difficulty in this, than in the planter improving his varieties of the cotton plant.—C. D. 1858.

perfect adaptation, must generally gain the victory in their contests. This kind of selection, however, is less rigorous than the other; it does not require the death of the less successful, but gives to them fewer descendants. The struggle falls, moreover, at a time of year when food is generally abundant, and perhaps the effect chiefly produced would be the modification of the secondary sexual characters, which are not related to the power of obtaining food, or to defence from enemies, but to fighting with or rivalling other males. The result of this struggle amongst the males may be compared in some respects to that produced by those agriculturists who pay less attention to the careful selection of all their young animals, and more to the occasional use of a choice mate.

II. *Abstract of a Letter from* C. Darwin, Esq., *to* Prof. Asa Gray, *Boston, U.S., dated Down, September 5th*, 1857.

1. It is wonderful what the principle of selection by man, that is the picking out of individuals with any desired quality, and breeding from them, and again picking out, can do. Even breeders have been astounded at their own results. They can act on differences inappreciable to an uneducated eye. Selection has been *methodically* followed in *Europe* for only the last half century; but it was occasionally, and even in some degree methodically, followed in the most ancient times. There must have been also a kind of unconscious selection from a remote period, namely in the preservation of the individual animals (without any thought of their offspring) most useful to each race of man in his particular circumstances. The "roguing," as nurserymen call the destroying of varieties which depart from their type, is a kind of selection. I am convinced that intentional and occasional selection has been the main agent in the production of our domestic races; but however this may be, its great power of modification has been indisputably shown in later times. Selection acts only by the accumulation of slight or greater variations, caused by external conditions, or by the mere fact that in generation the child is not absolutely similar to its parent. Man, by this power of accumulating variations, adapts living beings to his wants—may be said to make the wool of one sheep good for carpets, of another for cloth, &c.

2. Now suppose there were a being who did not judge by mere external appearances, but who could study the whole internal organization, who was never capricious, and should go on selecting for one object during millions of generations; who will say what he might not effect? In nature we have some *slight* variation occasionally in all parts; and I think it can be shown that changed conditions of existence is the main cause of the child not exactly resembling its parents; and in nature geology shows us what changes have taken place, and are taking place. We have almost unlimited time; no one but a practical geologist can fully appreciate this. Think of the Glacial period, during the whole of which the same species at least of shells have existed; there must have been during this period millions on millions of generations.

3. I think it can be shown that there is such an unerring power at work in *Natural Selection* (the title of my book), which selects exclusively for the good of each organic being. The elder De Candolle, W. Herbert, and Lyell have written excellently on the struggle for life; but even they have not written strongly enough. Reflect that every being (even the elephant) breeds at such a rate, that in a few years, or at most a few centuries, the surface of the earth would not hold the progeny of one pair. I have found it hard constantly to bear in mind that the increase of every single species is checked during some part of its life, or during some shortly recurrent generation. Only a few of those annually born can live to propagate their kind. What a trifling difference must often determine which shall survive, and which perish!

4. Now take the case of a country undergoing some change. This will tend to cause some of its inhabitants to vary slightly—not but that I believe most beings vary at all times enough for selection to act on them. Some of its inhabitants will be exterminated; and the remainder will be exposed to the mutual action of a different set of inhabitants, which I believe to be far more important to the life of each being than mere climate. Considering the infinitely various methods which living beings follow to obtain food by struggling with other organisms, to escape danger at various times of life, to have their eggs or seeds disseminated, &c. &c., I cannot doubt that during millions of generations individuals of a species will be occasionally born with some slight variation, profitable to some part of their economy. Such individuals will have a better chance of surviving, and

of propagating their new and slightly different structure; and the modification may be slowly increased by the accumulative action of natural selection to any profitable extent. The variety thus formed will either coexist with, or, more commonly, will exterminate its parent form. An organic being, like the woodpecker or misseltoe, may thus come to be adapted to a score of contingences—natural selection accumulating those slight variations in all parts of its structure, which are in any way useful to it during any part of its life.

5. Multiform difficulties will occur to every one, with respect to this theory. Many can, I think, be satisfactorily answered. *Natura non facit saltum* answers some of the most obvious. The slowness of the change, and only a very few individuals undergoing change at any one time, answers others. The extreme imperfection of our geological records answers others.

6. Another principle, which may be called the principle of divergence, plays, I believe, an important part in the origin of species. The same spot will support more life if occupied by very diverse forms. We see this in the many generic forms in a square yard of turf, and in the plants or insects on any little uniform islet, belonging almost invariably to as many genera and families as species. We can understand the meaning of this fact amongst the higher animals, whose habits we understand. We know that it has been experimentally shown that a plot of land will yield a greater weight if sown with several species and genera of grasses, than if sown with only two or three species. Now, every organic being, by propagating so rapidly, may be said to be striving its utmost to increase in numbers. So it will be with the offspring of any species after it has become diversified into varieties, or subspecies, or true species. And it follows, I think, from the foregoing facts, that the varying offspring of each species will try (only few will succeed) to seize on as many and as diverse places in the economy of nature as possible. Each new variety or species, when formed, will generally take the place of, and thus exterminate its less well-fitted parent. This I believe to be the origin of the classification and affinities of organic beings at all times; for organic beings always *seem* to branch and sub-branch like the limbs of a tree from a common trunk, the flourishing and diverging twigs destroying the less vigorous—the dead and lost branches rudely representing extinct genera and families.

This sketch is *most* imperfect; but in so short a space I cannot make it better. Your imagination must fill up very wide blanks.

C. Darwin.

III. *On the Tendency of Varieties to depart indefinitely from the Original Type.* By Alfred Russel Wallace.

One of the strongest arguments which have been adduced to prove the original and permanent distinctness of species is, that *varieties* produced in a state of domesticity are more or less unstable, and often have a tendency, if left to themselves, to return to the normal form of the parent species; and this instability is considered to be a distinctive peculiarity of all varieties, even of those occurring among wild animals in a state of nature, and to constitute a provision for preserving unchanged the originally created distinct species.

In the absence or scarcity of facts and observations as to *varieties* occurring among wild animals, this argument has had great weight with naturalists, and has led to a very general and somewhat prejudiced belief in the stability of species. Equally general, however, is the belief in what are called "permanent or true varieties,"—races of animals which continually propagate their like, but which differ so slightly (although constantly) from some other race, that the one is considered to be a *variety* of the other. Which is the *variety* and which the original *species*, there is generally no means of determining, except in those rare cases in which the one race has been known to produce an offspring unlike itself and resembling the other. This, however, would seem quite incompatible with the "permanent invariability of species," but the difficulty is overcome by assuming that such varieties have strict limits, and can never again vary further from the original type, although they may return to it, which, from the analogy of the domesticated animals, is considered to be highly probable, if not certainly proved.

It will be observed that this argument rests entirely on the assumption, that *varieties* occurring in a state of nature are in all respects analogous to or even identical with those of domestic animals, and are governed by the same laws as regards their permanence or further variation. But it is the object of the present paper to show that this assumption is altogether false, that there is a general principle in nature which will cause many *varieties* to survive the parent species,

and to give rise to successive variations departing further and further from the original type, and which also produces, in domesticated animals, the tendency of varieties to return to the parent form.

The life of wild animals is a struggle for existence. The full exertion of all their faculties and all their energies is required to preserve their own existence and provide for that of their infant offspring. The possibility of procuring food during the least favourable seasons, and of escaping the attacks of their most dangerous enemies, are the primary conditions which determine the existence both of individuals and of entire species. These conditions will also determine the population of a species; and by a careful consideration of all the circumstances we may be enabled to comprehend, and in some degree to explain, what at first sight appears so inexplicable—the excessive abundance of some species, while others closely allied to them are very rare.

The general proportion that must obtain between certain groups of animals is readily seen. Large animals cannot be so abundant as small ones; the carnivora must be less numerous than the herbivora; eagles and lions can never be so plentiful as pigeons and antelopes; the wild asses of the Tartarian deserts cannot equal in numbers the horses of the more luxuriant prairies and pampas of America. The greater or less fecundity of an animal is often considered to be one of the chief causes of its abundance or scarcity; but a consideration of the facts will show us that it really has little or nothing to do with the matter. Even the least prolific of animals would increase rapidly if unchecked, whereas it is evident that the animal population of the globe must be stationary, or perhaps, through the influence of man, decreasing. Fluctuations there may be; but permanent increase, except in restricted localities, is almost impossible. For example, our own observation must convince us that birds do not go on increasing every year in a geometrical ratio, as they would do, were there not some powerful check to their natural increase. Very few birds produce less than two young ones each year, while many have six, eight, or ten; four will certainly be below the average; and if we suppose that each pair produce young only four times in their life, that will also be below the average, supposing them not to die either by violence or want of food. Yet at this rate how tremendous would be the increase in a few years from a single pair! A simple calculation will show that in fifteen years each pair of birds would have increased

to nearly ten millions! whereas we have no reason to believe that the number of the birds of any country increases at all in fifteen or in one hundred and fifty years. With such powers of increase the population must have reached its limits, and have become stationary, in a very few years after the origin of each species. It is evident, therefore, that each year an immense number of birds must perish—as many in fact as are born; and as on the lowest calculation the progeny are each year twice as numerous as their parents, it follows that, whatever be the average number of individuals existing in any given country, *twice that number must perish annually*,—a striking result, but one which seems at least highly probable, and is perhaps under rather than over the truth. It would therefore appear that, as far as the continuance of the species and the keeping up the average number of individuals are concerned, large broods are superfluous. On the average all above *one* become food for hawks and kites, wild cats and weasels, or perish of cold and hunger as winter comes on. This is strikingly proved by the case of particular species; for we find that their abundance in individuals bears no relation whatever to their fertility in producing offspring. Perhaps the most remarkable instance of an immense bird population is that of the passenger pigeon of the United States, which lays only one, or at most two eggs, and is said to rear generally but one young one. Why is this bird so extraordinarily abundant, while others producing two or three times as many young are much less plentiful? The explanation is not difficult. The food most congenial to this species, and on which it thrives best, is abundantly distributed over a very extensive region, offering such differences of soil and climate, that in one part or another of the area the supply never fails. The bird is capable of a very rapid and long-continued flight, so that it can pass without fatigue over the whole of the district it inhabits, and as soon as the supply of food begins to fail in one place is able to discover a fresh feeding-ground. This example strikingly shows us that the procuring a constant supply of wholesome food is almost the sole condition requisite for ensuring the rapid increase of a given species, since neither the limited fecundity, nor the unrestrained attacks of birds of prey and of man are here sufficient to check it. In no other birds are these peculiar circumstances so strikingly combined. Either their food is more liable to failure, or they have not sufficient power of wing to search for it over an extensive area, or

during some season of the year it becomes very scarce, and less wholesome substitutes have to be found; and thus, though more fertile in offspring, they can never increase beyond the supply of food in the least favourable seasons. Many birds can only exist by migrating, when their food becomes scarce, to regions possessing a milder, or at least a different climate, though, as these migrating birds are seldom excessively abundant, it is evident that the countries they visit are still deficient in a constant and abundant supply of wholesome food. Those whose organization does not permit them to migrate when their food becomes periodically scarce, can never attain a large population. This is probably the reason why woodpeckers are scarce with us, while in the tropics they are among the most abundant of solitary birds. Thus the house sparrow is more abundant than the redbreast, because its food is more constant and plentiful,—seeds of grasses being preserved during the winter, and our farmyards and stubble-fields furnishing an almost inexhaustible supply. Why, as a general rule, are aquatic, and especially sea birds, very numerous in individuals? Not because they are more prolific than others, generally the contrary; but because their food never fails, the sea-shores and river-banks daily swarming with a fresh supply of small mollusca and crustacea. Exactly the same laws will apply to mammals. Wild cats are prolific and have few enemies; why then are they never as abundant as rabbits? The only intelligible answer is, that their supply of food is more precarious. It appears evident, therefore, that so long as a country remains physically unchanged, the numbers of its animal population cannot materially increase. If one species does so, some others requiring the same kind of food must diminish in proportion. The numbers that die annually must be immense; and as the individual existence of each animal depends upon itself, those that die must be the weakest—the very young, the aged, and the diseased,—while those that prolong their existence can only be the most perfect in health and vigour—those who are best able to obtain food regularly, and avoid their numerous enemies. It is, as we commenced by remarking, "a struggle for existence," in which the weakest and least perfectly organized must always succumb.

Now it is clear that what takes place among the individuals of a species must also occur among the several allied species of a group,—viz., that those which are best adapted to obtain a regular supply of food, and to defend themselves against the attacks of their enemies and the vicissitudes of the

seasons, must necessarily obtain and preserve a superiority in population; while those species which from some defect of power or organization are the least capable of counteracting the vicissitudes of food supply, &c., must diminish in numbers, and, in extreme cases, become altogether extinct. Between these extremes the species will present various degrees of capacity for ensuring the means of preserving life; and it is thus we account for the abundance or rarity of species. Our ignorance will generally prevent us from accurately tracing the effects to their causes; but could we become perfectly acquainted with the organization and habits of the various species of animals, and could we measure the capacity of each for performing the different acts necessary to its safety and existence under all the varying circumstances by which it is surrounded, we might be able even to calculate the proportionate abundance of individuals which is the necessary result.

If now we have succeeded in establishing these two points—1st, *that the animal population of a country is generally stationary, being kept down by a periodical deficiency of food, and other checks*; and, 2nd, *that the comparative abundance or scarcity of the individuals of the several species is entirely due to their organization and resulting habits, which, rendering it more difficult to procure a regular supply of food and to provide for their personal safety in some cases than in others, can only be balanced by a difference in the population which have to exist in a given area*—we shall be in a condition to proceed to the consideration of *varieties*, to which the preceding remarks have a direct and very important application.

Most or perhaps all the variations from the typical form of a species must have some definite effect, however slight, on the habits or capacities of the individuals. Even a change of colour might, by rendering them more or less distinguishable, affect their safety; a greater or less development of hair might modify their habits. More important changes, such as an increase in the power or dimensions of the limbs or any of the external organs, would more or less affect their mode of procuring food or the range of country which they inhabit. It is also evident that most changes would affect, either favourably or adversely, the powers of prolonging existence. An antelope with shorter or weaker legs must necessarily suffer more from the attacks of the feline carnivora; the passenger pigeon with less powerful wings would sooner or later be affected in its powers of procuring a regular supply of food; and in both cases the result must necessarily be a

diminution of the population of the modified species. If, on the other hand, any species should produce a variety having slightly increased powers of preserving existence, that variety must inevitably in time acquire a superiority in numbers. These results must follow as surely as old age, intemperance, or scarcity of food produce an increased mortality. In both cases there may be many individual exceptions ; but on the average the rule will invariably be found to hold good. All varieties will therefore fall into two classes—those which under the same conditions would never reach the population of the parent species, and those which would in time obtain and keep a numerical superiority. Now, let some alteration of physical conditions occur in the district—a long period of drought, a destruction of vegetation by locusts, the irruption of some new carnivorous animal seeking "pastures new"—any change in fact tending to render existence more difficult to the species in question, and tasking its utmost powers to avoid complete extermination ; it is evident that, of all the individuals composing the species, those forming the least numerous and most feebly organized variety would suffer first, and, were the pressure severe, must soon become extinct. The same causes continuing in action, the parent species would next suffer, would gradually diminish in numbers, and with a recurrence of similar unfavourable conditions might also become extinct. The superior variety would then alone remain, and on a return to favourable circumstances would rapidly increase in numbers and occupy the place of the extinct species and variety.

The *variety* would now have replaced the *species*, of which it would be a more perfectly developed and more highly organized form. It would be in all respects better adapted to secure its safety, and to prolong its individual existence and that of the race. Such a variety *could not* return to the original form ; for that form is an inferior one, and could never compete with it for existence. Granted, therefore, a "tendency" to reproduce the original type of the species, still the variety must ever remain preponderant in numbers, and under adverse physical conditions *again alone survive.* But this new, improved, and populous race might itself, in course of time, give rise to new varieties, exhibiting several diverging modifications of form, any of which, tending to increase the facilities for preserving existence, must, by the same general law, in their turn become predominant. Here, then, we have *progression and continued divergence* deduced from the general laws which regulate the existence of animals

in a state of nature, and from the undisputed fact that varieties do frequently occur. It is not, however, contended that this result would be invariable; a change of physical conditions in the district might at times materially modify it, rendering the race which had been the most capable of supporting existence under the former conditions now the least so, and even causing the extinction of the newer and, for a time, superior race, while the old or parent species and its first inferior varieties continued to flourish. Variations in unimportant parts might also occur, having no perceptible effect on the life-preserving powers; and the varieties so furnished might run a course parallel with the parent species, either giving rise to further variations or returning to the former type. All we argue for is, that certain varieties have a tendency to maintain their existence longer than the original species, and this tendency must make itself felt; for though the doctrine of chances or averages can never be trusted to on a limited scale, yet, if applied to high numbers, the results come nearer to what theory demands, and, as we approach to an infinity of examples, become strictly accurate. Now the scale on which nature works is so vast—the numbers of individuals and periods of time with which she deals approach so near to infinity, that any cause, however slight, and however liable to be veiled and counteracted by accidental circumstances, must in the end produce its full legitimate results.

Let us now turn to domesticated animals, and inquire how varieties produced among them are affected by the principles here enunciated. The essential difference in the condition of wild and domestic animals is this,—that among the former, their well-being and very existence depend upon the full exercise and healthy condition of all their senses and physical powers, whereas, among the latter, these are only partially exercised, and in some cases are absolutely unused. A wild animal has to search, and often to labour, for every mouthful of food—to exercise sight, hearing, and smell in seeking it, and in avoiding dangers, in procuring shelter from the inclemency of the seasons, and in providing for the subsistence and safety of its offspring. There is no muscle of its body that is not called into daily and hourly activity; there is no sense or faculty that is not strengthened by continual exercise. The domestic animal, on the other hand, has food provided for it, is sheltered, and often confined, to guard it against the vicissitudes of the seasons, is carefully secured from the attacks of its natural enemies, and seldom

even rears its young without human assistance. Half of its senses and faculties are quite useless; and the other half are but occasionally called into feeble exercise, while even its muscular system is only irregularly called into action.

Now when a variety of such an animal occurs, having increased power or capacity in any organ or sense, such increase is totally useless, is never called into action, and may even exist without the animal ever becoming aware of it. In the wild animal, on the contrary, all its faculties and powers being brought into full action for the necessities of existence, any increase becomes immediately available, is strengthened by exercise, and must even slightly modify the food, the habits, and the whole economy of the race. It creates as it were a new animal, one of superior powers, and which will necessarily increase in numbers and outlive those inferior to it.

Again, in the domesticated animal all variations have an equal chance of continuance; and those which would decidedly render a wild animal unable to compete with its fellows and continue its existence are no disadvantage whatever in a state of domesticity. Our quickly fattening pigs, short-legged sheep, pouter pigeons, and poodle dogs could never have come into existence in a state of nature, because the very first step towards such inferior forms would have led to the rapid extinction of the race; still less could they now exist in competition with their wild allies. The great speed but slight endurance of the race horse, the unwieldy strength of the ploughman's team, would both be useless in a state of nature. If turned wild on the pampas, such animals would probably soon become extinct, or under favourable circumstances might each lose those extreme qualities which would never be called into action, and in a few generations would revert to a common type, which must be that in which the various powers and faculties are so proportioned to each other as to be best adapted to procure food and secure safety,—that in which by the full exercise of every part of his organization the animal can alone continue to live. Domestic varieties, when turned wild, *must* return to something near the type of the original wild stock, *or become altogether extinct.*

We see, then, that no inferences as to varieties in a state of nature can be deduced from the observation of those occurring among domestic animals. The two are so much opposed to each other in every circumstance of their existence, that what applies to the one is almost sure not to apply

to the other. Domestic animals are abnormal, irregular, artificial; they are subject to varieties which never occur and never can occur in a state of nature: their very existence depends altogether on human care; so far are many of them removed from that just proportion of faculties, that true balance of organization, by means of which alone an animal left to its own resources can preserve its existence and continue its race.

The hypothesis of Lamarck—that progressive changes in species have been produced by the attempts of animals to increase the development of their own organs, and thus modify their structure and habits—has been repeatedly and easily refuted by all writers on the subject of varieties and species, and it seems to have been considered that when this was done the whole question has been finally settled; but the view here developed renders such an hypothesis quite unnecessary, by showing that similar results must be produced by the action of principles constantly at work in nature. The powerful retractile talons of the falcon- and the cat-tribes have not been produced or increased by the volition of those animals; but among the different varieties which occurred in the earlier and less highly organized forms of these groups, *those always survived longest which had the greatest facilities for seizing their prey.* Neither did the giraffe acquire its long neck by desiring to reach the foliage of the more lofty shrubs, and constantly stretching its neck for the purpose, but because any varieties which occurred among its antitypes with a longer neck than usual *at once secured a fresh range of pasture over the same ground as their shorter-necked companions, and on the first scarcity of food were thereby enabled to outlive them.* Even the peculiar colours of many animals, especially insects, so closely resembling the soil or the leaves or the trunks on which they habitually reside, are explained on the same principle; for though in the course of ages varieties of many tints may have occurred, *yet those races having colours best adapted to concealment from their enemies would inevitably survive the longest.* We have also here an acting cause to account for that balance so often observed in nature,—a deficiency in one set of organs always being compensated by an increased development of some others—powerful wings accompanying weak feet, or great velocity making up for the absence of defensive weapons; for it has been shown that all varieties in which an unbalanced deficiency occurred could not long continue their existence. The action of this principle is exactly like that

of the centrifugal governor of the steam engine, which checks and corrects any irregularities almost before they become evident ; and in like manner no unbalanced deficiency in the animal kingdom can ever reach any conspicuous magnitude, because it would make itself felt at the very first step, by rendering existence difficult and extinction almost sure soon to follow. An origin such as is here advocated will also agree with the peculiar character of the modifications of form and structure which obtain in organized beings—the many lines of divergence from a central type, the increasing efficiency and power of a particular organ through a succession of allied species, and the remarkable persistence of unimportant parts such as colour, texture of plumage and hair, form of horns or crests, through a series of species differing considerably in more essential characters. It also furnishes us with a reason for that "more specialized structure" which Professor Owen states to be a characteristic of recent compared with extinct forms, and which would evidently be the result of the progressive modification of any organ applied to a special purpose in the animal economy.

We believe we have now shown that there is a tendency in nature to the continued progression of certain classes of *varieties* further and further from the original type—a progression to which there appears no reason to assign any definite limits—and that the same principle which produces this result in a state of nature will also explain why domestic varieties have a tendency to revert to the original type. This progression, by minute steps, in various directions, but always checked and balanced by the necessary conditions, subject to which alone existence can be preserved, may, it is believed, be followed out so as to agree with all the phenomena presented by organized beings, their extinction and succession in past ages, and all the extraordinary modifications of form, instinct, and habits which they exhibit.

Ternate, February, 1858.

SELECTIONS

FROM

MALTHUS'S ESSAY

ON

POPULATION,

WHICH SUGGESTED THE IDEA OF
NATURAL SELECTION.

Note on the passages of MALTHUS'S '*Principles of Population*' *which suggested the idea of Natural Selection to Darwin and myself.*

By ALFRED R. WALLACE.

IN order to refresh my memory I have again looked through Malthus's work, and I feel sure that what influenced me was not any special passage or passages, but the cumulative effect of chapters iii. to xii. of the first volume (and more especially chapters iii. to viii.) occupying about 150 pages. In these chapters are comprised very detailed accounts from all available sources, of the various causes which keep down the population of savage and barbarous nations, in America, Africa, and Asia, notwithstanding that they all possess a power of increase sufficient to produce a dense population for any of the continents in a few centuries.

In order to give an idea, though a very imperfect one, of the nature of the facts adduced by him, I have selected the following passages as being fairly illustrative of the whole. The references are to the sixth edition, London: 1826, vol. i.

CHAPTER IV.

Of the Checks to Population among the American Indians.

Pages 35–37, line 2.

We may next turn our view to the vast continent of America, the greatest part of which was found to be inhabited by small independent tribes of savages, subsisting, nearly like the natives of New Holland, on the productions of unassisted nature. The soil was covered by an almost universal forest, and presented few of those fruits and esculent vegetables which grow in such profusion in the islands of the South Sea. The produce of a most rude and imperfect agriculture, known to some of the tribe of hunters, was so trifling as to be considered only as a feeble aid to the subsistence acquired by the chase. The

inhabitants of this new world therefore might be considered as living principally by hunting and fishing * ; and the narrow limits to this mode of subsistence are obvious. The supplies derived from fishing could reach only those who were within a certain distance of the lakes, the rivers, or the sea-shore ; and the ignorance and indolence of the improvident savage would frequently prevent him from extending the benefits of these supplies much beyond the time when they were actually obtained. The great extent of territory required for the support of the hunter has been repeatedly stated and acknowledged †. The number of wild animals within his reach, combined with the facility with which they may be either killed or insnared, must necessarily limit the number of his society. The tribes of hunters, like beasts of prey, whom they resemble in their mode of subsistence, will consequently be thinly scattered over the surface of the earth. Like beasts of prey, they must either drive away or fly from every rival, and be engaged in perpetual contests with each other ‡.

Under such circumstances, that America should be very thinly peopled in proportion to its extent of territory, is merely an exemplification of the obvious truth, that population cannot increase without the food to support it. But the interesting part of the inquiry, that part, to which I would wish particularly to draw the attention of the reader, is, the mode by which the population is kept down to the level of this scanty supply. It cannot escape observation, that an insufficient supply of food to any people does not shew itself merely in the shape of famine, but in other more permanent forms of distress, and in generating certain customs, which operate sometimes with greater force in the prevention of a rising population than in its subsequent destruction.

Page 39, lines 5–21.

In every part of the world, one of the most general characteristics of the savage is to despise and degrade the female sex §. Among most of the tribes in America their

* Robertson's History of America, vol. ii. b. iv. p. 127 *et seq.*, octavo edit. 1780.

† Franklin's Miscell. p. 2. ‡ Robertson, b. iv. p. 129.

§ Robertson, b. iv. p. 103. Lettres Edif. passim. Charlevoix, Hist. Nouv. Fr. tom. iii. p. 287. Voy. de Pérouse. c. ix. p. 492, 4to. London.

condition is so peculiarly grievous, that servitude is a name too mild to describe their wretched state. A wife is no better than a beast of burden. While the man passes his days in idleness or amusement, the woman is condemned to incessant toil. Tasks are imposed upon her without mercy, and services are received without complacence or gratitude *. There are some districts in America where this state of degradation has been so severely felt, that mothers have destroyed their female infants, to deliver them at once from a life in which they were doomed to such a miserable life of slavery †.

Chapter VIII.

On the Checks to Population in the different Parts of Africa.

Pages 158–164.

The description, which Bruce gives of some parts of the country which he passed through on his return home, presents a picture more dreadful even than the state of Abyssinia, and shows how little population depends on the birth of children, in comparison of the production of food and those circumstances of natural and political situation which influence this produce.

"At half past six," Bruce says, "we arrived at Garigana, "a village whose inhabitants had all perished with hunger "the year before; their wretched bones being all unburied "and scattered upon the surface of the ground where the "village formerly stood. We encamped among the bones "of the dead; no space could be found free from them." ‡

Of another town or village in his route he observes :—

"The strength of Teawa was 25 horse. The rest of the in- "habitants might be 1200 naked miserable and despicable "Arabs, like the rest of those which live in villages "Such was the state of Teawa. Its consequence was only "to remain till the Daveina Arabs should resolve to attack "it, when its corn-fields being burnt and destroyed in a night

* Robertson, b. iv. p. 105. Lettres Edif. tom. vi. p. 329. Major Roger's North America, p. 211. Creuxii Hist. Canad. p. 57.

† Robertson, b. iv. p. 106. Raynal, Hist. des Indies, tom. iv. c. vii. p. 110, 8vo., 10 vol., 1795.

‡ Bruce, vol. iv. p. 349.

"by a multitude of horsemen, the bones of its inhabitants "scattered upon the earth would be all its remains, like "those of the miserable village of Garigana." *

"There is no water between Teawa and Beyla. Onee "Indedidema and a number of villages were supplied with "water from wells, and had large crops of Indian corn "sown about their possessions. The curse of that country, "the Daveina Arabs, have destroyed Indedidema and all "the villages about it; filled up their wells, burnt their "crops, and exposed all the inhabitants to die by famine." †

Soon after leaving Sennaar, he says: "We began to "see the effects of rain having failed. There was little "corn sown, and that so late as to be scarcely above ground. "It seems the rain begins later as they pass northward. "Many people were here employed in gathering grass-seeds "to make a very bad kind of bread. These people appear "perfect skeletons, and no wonder, as they live upon such "fare. Nothing increases the danger of travelling and "prejudice against strangers more, than the scarcity of "provisions in the country through which you are to "pass." ‡

"Came to Eltic, a straggling village about half a mile "from the Nile, in the North of a large bare plain; all "pasture, except the banks of the river which are "covered with wood. We now no longer saw any corn "sown. The people here were at the same miserable "employment as those we had seen before, that of gathering "grass-seeds." §

Under such circumstances of climate and political situation, though a greater degree of foresight, industry and security, might considerably better their condition and increase their population, the birth of a greater number of children without these concomitants would only aggravate their misery, and leave their population where it was.

The same may be said of the once flourishing and populous country of Egypt. Its present depressed state has not been caused by the weakening of the principle of increase, but by the weakening of the principle of industry and foresight, from the insecurity of property consequent on a most tyrannical and oppressive government. The principle of increase in Egypt at present does all that it is possible for it to do. It keeps the population fully up to the

* Bruce, vol. iv. p. 353.
† *Id.* p. 411.
‡ *Id.* p. 511.
§ *Id.* p. 511.

level of the means of subsistence; and, were its power ten times greater than it really is, it could do no more.

The remains of ancient works, the vast lakes, canals, and large conduits for water destined to keep the Nile under control, serving as reservoirs to supply a dry year, and as drains and outlets to prevent the superabundance of water in wet years, sufficiently indicate to us that the former inhabitants of Egypt by art and industry contrived to fertilize a much greater quantity of land from the overflowings of their river, than is done at present; and to prevent, in some measure, the distresses which are now so frequently experienced from a redundant or insufficient inundation *.

It is said of the governor Petronius, that, effecting by art what was denied by nature, he caused abundance to prevail in Egypt under disadvantages of such a deficient inundation, as had always before been accompanied by dearth †. A flood too great is as fatal to the husbandman as one that is deficient; and the ancients had, in consequence, drains and outlets to spread the superfluous waters over the thirsty sands of Lybia, and render even the desert habitable. These works are now all out of repair, and by ill management often produce mischief instead of good. The causes of this neglect, and consequently of the diminished means of subsistence, are obviously to be traced to the extreme ignorance and brutality of the government, and the wretched state of the people. The Mamelukes, in whom the principal power resides, think only of enriching themselves, and employ for this purpose what appears to them to be the simplest method, that of seizing wealth wherever it may be found, of wresting it by violence from the possessor, and of continually imposing new and arbitrary contributions ‡. Their ignorance and brutality, and the constant state of alarm in which they live, prevent them from having any views of enriching the country, the better to prepare it for their plunder. No public works therefore are to be expected from the government, and no individual proprietor dares to undertake any improvement which might imply the possession of capital, as it would probably be the immediate signal of his destruction. Under such circumstances we cannot be surprised that the ancient works

* Bruce, vol. iii. c. xvii. p. 710.

† Voyage de Volney, tom. i. c. iii. p. 33, 8vo.

‡ Voyage de Volney, tom. i. c. xii. p. 170.

are neglected, that the soil is ill cultivated, and that the means of subsistence, and consequently the population, are greatly reduced. But such is the natural fertility of the Delta from the inundations of the Nile, that even without any capital employed upon the land, without a right of succession, and consequently almost without a right of property, it still maintains a considerable population in proportion to its extent, sufficient, if property were secure, and industry well directed, gradually to improve and extend the cultivation of the country and restore it to its former state of prosperity. It may be safely pronounced of Egypt that it is not the want of population that has checked its industry, but the want of industry that has checked its population.

The immediate causes which keep down the population to the level of the present contracted means of subsistence, are but too obvious. The peasants are allowed for their maintenance only sufficient to keep them alive *. A miserable sort of bread made of doura without leaven or flavour, cold water, and raw onions make up the whole of their diet. Meat and fat, of which they are passionately fond, never appear but on great occasions, and among those who are more at their ease. The habitations are huts made of earth, where a stranger would be suffocated with the heat and smoke; and where the diseases generated by want of cleanliness, by moisture, and by bad nourishment, often visit them and commit great ravages. To these physical evils are added a constant state of alarm, the fear of the plunder of the Arabs, and the visits of the Mamelukes, the spirit of revenge transmitted in families, and all the evils of a continual civil war †.

In the year 1783 the plague was very fatal, and in 1784 and 1785 a dreadful famine reigned in Egypt, owing to a deficiency in the inundation of the Nile. Volney draws a frightful picture of the misery that was suffered on this occasion. The streets of Cairo, which at first were full of beggars, were soon cleared of all these objects, who either perished or fled. A vast number of unfortunate wretches,

* Voyage de Volney, tom. i. c. xii. p. 172.

† Volney, tom. i. c. xii. p. 173. This sketch of the state of the peasantry in Egypt given by Volney seems to be nearly confirmed by all other writers on this subject; and particularly in a valuable paper entitled Considérations générales sur l'Agriculture de l'Egypte, par L. Reynier (Mémoires sur l'Egypte, tom. iv. p. 1).

in order to escape death, spread themselves over all the neighbouring countries, and the towns of Syria were inundated with Egyptians. The streets and public places were crowded by famished and dying skeletons. All the most revolting modes of satisfying the cravings of hunger were resorted to; the most disgusting food was devoured with eagerness; and Volney mentions the having seen under the walls of ancient Alexandria two miserable wretches seated on the carcase of a camel, and disputing with the dogs its putrid flesh. The depopulation of the two years was estimated at one-sixth of all the inhabitants *.

It was the perusal of such statements as these, extending over every part of the world, and very varied in their details, that produced such a deep and permanent impression on my mind, though the individual facts were forgotten. When, ten or twelve years later, while thinking (as I had thought for years) over the possible causes of the change of species, the action of these "positive checks" to increase, as Malthus termed them, suddenly occurred to me. I then saw that war, plunder and massacres among men were represented by the attacks of carnivora on herbivora, and of the stronger upon the weaker among animals. Famine, droughts, floods and winter's storms, would have an even greater effect on animals than on men; while as the former possessed powers of increase from twice to a thousand-fold greater than the latter, the ever-present annual destruction must also be many times greater.

Then there flashed upon me, as it had done twenty years before upon Darwin, the *certainty*, that those which, year by year, survived this terrible destruction must be, on the whole, those which had some little superiority enabling them to escape each special form of death to which the great majority succumbed—that, in the well-known formula, the fittest would survive. Then I at once saw, that the ever present *variability* of all living things would furnish the material from which, by the mere weeding out of those

* Voy. de Volney, tom. i. c. xii. s. ii.

less adapted to the actual conditions, the fittest alone would continue the race. But this would only tend to the persistence of those best adapted to the actual conditions ; and on the old idea of the permanence and practical unchangeability of the inorganic world, except for a few local and unimportant catastrophes, there would be no necessary change of species.

But along with Malthus I had read, and been even more deeply impressed by, Sir Charles Lyell's immortal 'Principles of Geology,' which had taught me that the inorganic world—the whole surface of the earth, its seas and lands, its mountains and valleys, its rivers and lakes, and every detail of its climatic conditions, were and always had been in a continual state of slow modification. Hence it became obvious that the forms of life must have become continually adjusted to these changed conditions in order to survive. The succession of fossil remains throughout the whole geological series of rocks is the record of this change ; and it became easy to see that the extreme slowness of these changes was such as to allow ample opportunity for the continuous automatic adjustment of the organic to the inorganic world, as well as of each organism to every other organism in the same area, by the simple processes of "variation and survival of the fittest." Thus was the fundamental idea of the "origin of species" logically formulated from the consideration of a series of well-ascertained facts.

[Received 28th August, 1908.]

PORTRAITS

OF THE

MEDALLISTS,

1st JULY, 1908.

(Pls. 4–10.)

PLATE 4.

Dr. Alfred Russel Wallace, O.M., F.R.S.

From photograph taken by the London Stereoscopic Company.



Alfred R. Wallace

PLATE 5.

Sir Joseph Dalton Hooker, O.M., G.C.S.I., F.R.S.

From a photograph by W. J. Hawker, of Bournemouth, the negative lent by Lady Hooker.

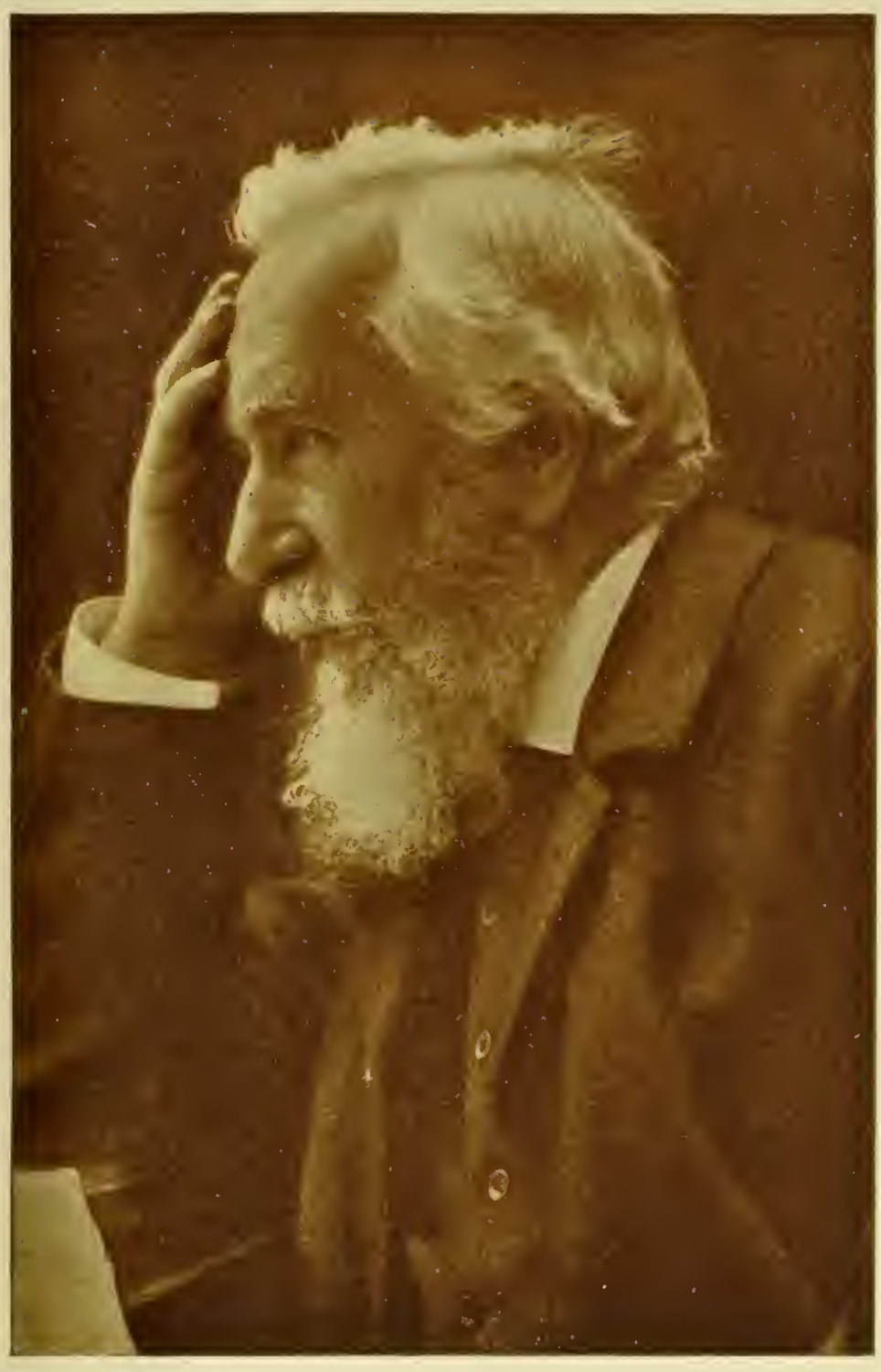


Jos. D. Hooker.

PLATE 6.

Professor Ernst Haeckel.

From a photograph by E. Tesch, Jena.



Ernst Haeckel

PLATE 7.

Professor August Weismann.

From a photograph by C. Ruf, Freiburg-im-Breisgau.



August Weismann

PLATE 8.

Professor Eduard Strasburger.
From a photograph by Joseph Schneider, Bonn.



E. Strasburger

PLATE 9.

Dr. Francis Galton, F.R.S.
From a photograph by Frederick Hollyer.



Francis Galton

PLATE 10.

Sir Edwin Ray Lankester, K.C.B., F.R.S.
From a painting by the Hon. John Collier.



E. Ray Lankester

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